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The Magazine of

DECEMBER, 1951

TOOLING and PRODUCTION

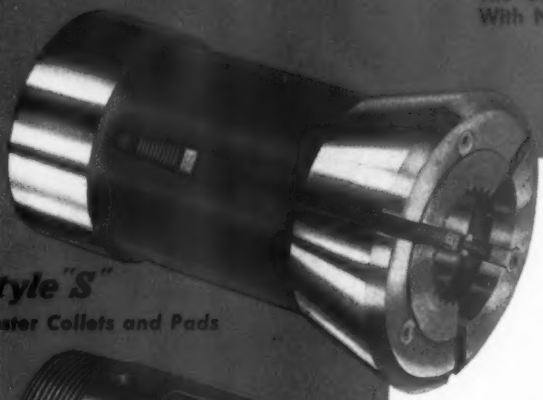
TOOL & DIE JOURNAL

HARDINGE
ELMIRA, N.Y.

STANDARD EQUIPMENT

in Progressive Screw Machine Plants

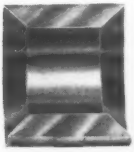
The Only MASTER COLLET
With No Work Pressure on the Screw.

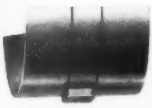


tyle "S"
aster Collets and Pads

Pads Interchangeable Among
Different Makes of Automatics

tyle "B"
aster Feed Fingers and Pads





HARDINGE BROTHERS, INC., ELMIRA, N. Y.

YOUR HELP IS NEEDED

to get in the

DORMANT SCRAP

At current steel production rates, 50% MORE SCRAP is needed than in the peak year of World War II. The shortage is so real that steel company representatives are calling on every company in the country to find ways of relieving the situation.

Here's How YOU can help

1. Take a fresh look at your own plant scrap and salvage activities.
2. Call in your dealer—sell your scrap—NOW!

WAD 3865 B

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ALLEGHENY LUDLUM STEEL CORPORATION

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Here are the end mills you can count on for fast, free cutting and extra long life—a bonus provided by complete uniformity and assured by Putnam's rigid quality control. For more work for your money, specify Putnam High Speed End Mills. Over 1000 standard sizes and types available.

PUTNAM
TOOL COMPANY
2985 CHARLEVOIX AVENUE · DETROIT 7 MICHIGAN

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The Magazine of

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

1975 Lee Road • CLEVELAND 18, OHIO

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Take a tip from the country's largest users of drill jig bushings. Order from the convenient Ex-Cell-O Catalog.

To satisfy the needs of your purchasing and engineering departments be sure to have an adequate supply of Ex-Cell-O Bushing Catalog, Bulletin 35371. Ask for the copies you need.

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MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
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XLO
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51-53

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* Electro-Magnetic Clutch and Brake – another NEW on Cincinnati Shapers

Now, with one convenient control the new electro-magnetic clutch and brake start and stop Cincinnati Shapers with a finger touch. It is the simplest, fastest control on any shaper.

Important advantages:

1. Ram is positioned quickly, accurately by instant action of clutch and brake.
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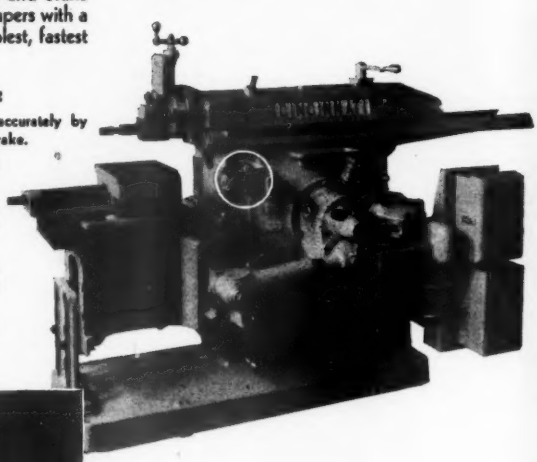
3. The single control lever is at the most convenient operator position.
4. Clutch and brake operate without grab . . . are powerful and smooth in action.
5. No adjustment of clutch or brake is required.



This clutch and brake are standard on all new Cincinnati Shapers. They are Warner units which have been thoroughly proven on machine tools.

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CINCINNATI 25 OHIO U.S.A.

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proved on every machine

more production

lower costs

"CB" MASTER COLLET
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Balas Master Collets for all multi-spindle automatics from 7/8" capacity and over.

BALAS COLLETS

Balas Master Collets reduce set-up time because they are front loading . . . the pads are easily changed without disturbing the setting of the collet. They run truer, grip tighter and work faster, increase your production and lower your costs regardless of the make of machine or type of material you use. In addition, Balas Master Collets handle stock to full capacity of the machine, thereby reducing collet inventory.

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Balas Master Pushers for all sizes of automatics furnished with steel, cast-iron, bronze or hardened Meehanite pads depending on the requirements of the job.

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Balas Master Pushers eliminate lost production time by permitting rapid change-over from one stock size to another by merely changing pads. The unique design and construction of these pushers guarantee long trouble-free operation. Balas Master Pushers solve your difficult feeding jobs and speed up your production. They have proved to be outstanding "time-and-money-savers" on all types of machines in thousands of large and small plants throughout the nation.

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Danly precision makes every Danly Die Set a reliable base for the finest die work . . . and every Danly Supply item a dependable time-saver.

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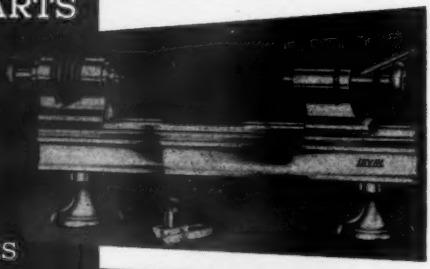

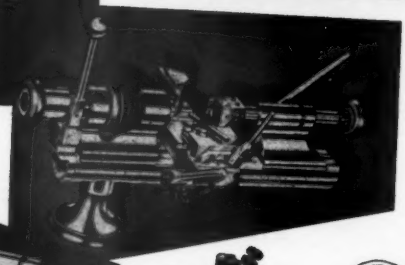

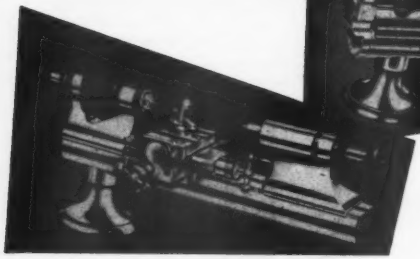

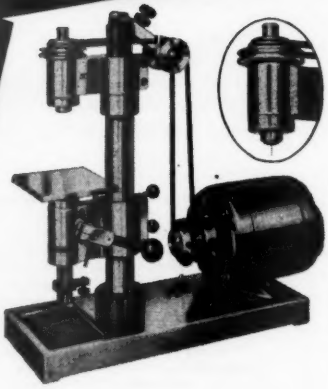

An extremely sensitive drill press for very small drills down to .002". Drills held in accurate collets to minimize deviation. Spindle run-out less than .0001". Finger tip control enables operator to feel progress of drill.

LOUIS LEVIN & SON, INC.
782 E. Pico Blvd., Los Angeles 21

Enlarged cross section of the teeth of a typical Nicholson file.

The right teeth make a big difference

Proper design, even height, uniform sharpness and correct hardening of teeth are tremendously important in lengthening the life and increasing the efficiency of a file. They take on added significance as defense preparedness calls for production speed-ups, steel conservations and maximum tool wear.

Nicholson manufacture has always given uppermost thought to these vital factors relating to the myriads of tiny "business ends" of one of industry's most indispensable hand tools.

Thus, it can be said that Nicholson and Black Diamond files "speak through their teeth." And what they say is, *"Twelve perfect files in every dozen*—made from top-quality file steel and 87 years' experience." *Sold through industrial distributors.*

HOW TO SELECT, USE AND CARE FOR The right file for the job is interestingly described in words and pictures in Nicholson's famous book, **"FILE FILOSOPHY."** FREE. How many copies do you need? Write to—

NICHOLSON FILE CO., 99 Acorn St., Providence 1, R.I.
(In Canada, Port Hope, Ont.)

NICHOLSON
A FILE FOR EVERY PURPOSE

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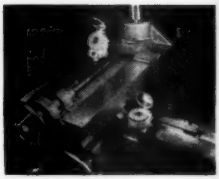
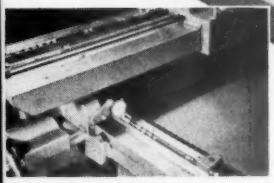
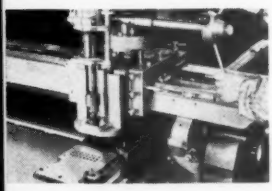
IN A CLASS BY ITSELF

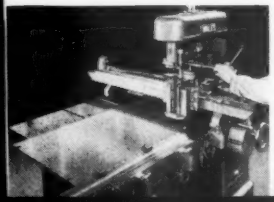




LOCATING . . . Holes are located by placing end measures in V-grooves on bridge and slide rail (or by using a precision optical gage as shown in extreme right illustration). Two speed gearing on both front-to-back and right-to-left settings provide rapid traverse for rough positioning and slow speed for "nursing in". Air locking clamps are provided for rigid positioning on both horizontal and longitudinal planes.



DRILLING . . . Showing typical small template being drilled with drill head assembly and slide rail locked in position by air clamps.



REAMING . . . Showing hole in large template being reamed by simply interchanging the drill and bushing with corresponding size reamer and reamer bushing.

WALES
DRILLING MACHINE
For Precision Locating, Drilling and Reaming of Holes

● This exclusive Wales Drilling Machine fills a definite need. *There is no other drilling machine or jig borer like it.*

Accuracy is the primary consideration in building this specially designed and ruggedly constructed Wales Drilling Machine which combines simplicity of operation, easier locating and faster production.

The illustrations at left show *how this Wales Drilling Machine operates.* Conveniently located built-in 1/32" scales and dial-type gages calibrated in ten thousandths of an inch accurately locate drill head and slide rail.

For the complete story on Wales Drilling Machine, write TODAY for fully-illustrated, functionally-colored Catalog DM

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355 PAYNE AVE., NORTH TONAWANDA, N. Y.
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Specialists in Punching and Notching Equipment

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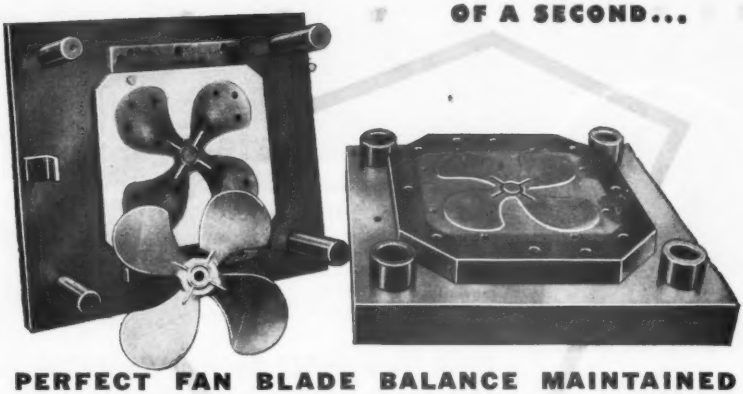

PERFECT FAN BLADE BALANCE MAINTAINED

with a compound die and

PRODUCTO DIE SET

This blade — used in an oscillating, cooling fan — runs at 3600 R.P.M. Perfect blade balance must be maintained for quiet, efficient operation. Such an exacting demand could be met only by using the most accurate of die sets. A PRODUCTO Special Die Set handles this job very efficiently... at a production rate of between 500 and 1000 blanks per hour an average of 85,000 pieces between grinds is maintained.

The job specifications indicated no burrs would be allowed while maintaining a tolerance of ±.001" in producing this 10" diameter fan blade. The strip stock used, H.H.C.R. Steel, 1/32" thick in 12 ft. lengths, assures perfectly flat blanks, (a final operation adds the necessary blade pitch).

The 18" x 14", four pin, Special PRODUCTO Die Set (above) is one of many approved wholeheartedly by our customers. For your next die set buy PRODUCTO and experience the satisfaction of seeing a tough job well done.

Call "Producto" in classified telephone directory in major stamping centers. Fast service thru 26 Producto Representatives.

THE PRODUCTO MACHINE COMPANY

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2PDSOR

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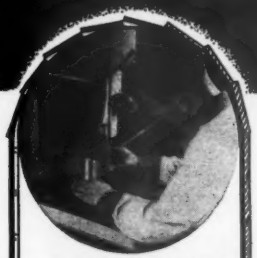
to easier, more accurate filing:

Guide the Work Instead of the File
— Cut all of the Time



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FROM LOCAL STOCK!

DoALL precision file bands are available for immediate delivery—Get the right type for every job. For cutting aluminum, brass, cast iron, copper, zinc, steel and non-ferrous metals DoALL file bands come in flat, oval and half round sizes of ¼", ⅜", ½".

SEND FOR BULLETIN

Top: Internal filing easily done on thick, thin or irregular shapes.

Bottom: Remove flash, irregularities from castings, forgings, etc., quicker at less cost.

Check these DoALL Precision Band Filing Features that handle all External and Internal Filing Jobs

1. 4 times faster than jig filing. 9 times faster than hand filing.
2. Easy to operate. Handwheel control of variable speed means more efficient chip removal and longer file life.
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YOU don't need years of experience to acquire that "touch" of the expert hand filer. Just feed the work into the DoALL Band Filer and quickly get a smoother, more accurate finish. DoALL continuous band filing really bites off the metal in uniform quantities—lets you maintain precision of cut for both external and internal filing jobs. For tool and die shops, foundries, material fabricators or what are you, DoALL band filing is your answer to better, faster work at minimum cost. Ask for a FREE DEMONSTRATION in your own plant. Call your local DoALL store or write:

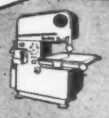
THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

INDUSTRY'S NEW TOOLS

DoALL

33 SALES-SERVICE STORES

BM-10-5



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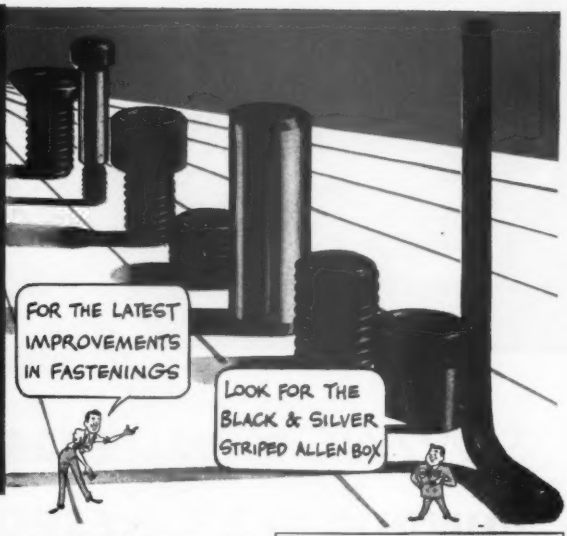
You're ahead of the parade with..

ALLEN ⬡ HEAD SCREWS



New manufacturing methods and improved alloys are constantly bettering the quality and uniformity of socket screws, dowel pins and pipe plugs.

Not all the improvements are made first by Allen but *a very large percentage of them are.* Some of the most important have yet to be duplicated even after years of trying.

If You Buy Socket Screws, Dowel Pins or Pipe Plugs, standardize on genuine Allen products to get more important improvements sooner.

If You Are Designing or Improving a Product, check with Allen directly or through your industrial distributor. Frequently a long search for more satisfactory fastenings ends in the Allen engineering department.

SOLD ONLY THROUGH LEADING DISTRIBUTORS. Write the factory direct for technical information and descriptive literature.

Ask Raytheon:

Allen ⬡ Head screws are required to meet the standards of most of the Raytheon products manufactured on Government contracts; hence they are used widely on the equipment made by this prominent manufacturer.

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine "Pressur-formed" Allen ⬡ Head screws in this black and silver box.

ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.

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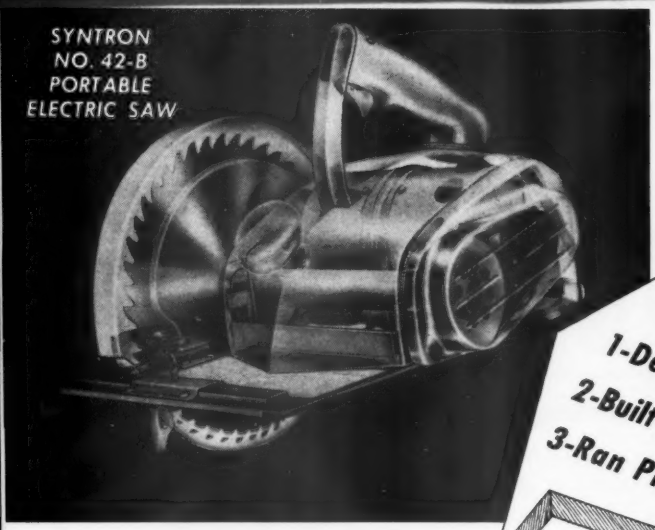

Barth
1-Designed the Tooling
2-Built the Tools & Dies
3-Ran Production

SYNTRON BELIEVES in "UNDIVIDED" RESPONSIBILITY!

Syntron Confidently Sent their parts prints on the No. 42-B Portable Electric Saw to Barths and, from there on in, Barth carried the ball!

Barth engineers designed the tool and die requirements.

Barth die craftsmen built the tools and dies.

Barth equipment and men supplemented Syntron's own production in running production on these tools and dies.

Syntron enjoys an enviable reputation for the production of fine, superior quality electric tools and equipment.

Barth's selection, by Syntron, as a source for engineering and production service on tools and dies worthy of Syntron's high standards, is the achievement of years of sincere and experienced service to American industry by Barth.

If you have a designing, tooling, production or special machinery problem, why not consult Barth? Write for catalogue.

BARTH'S NEW PLANT

BARTH STAMPING & MACHINE WORKS, I

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DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHIN

MICROBORE
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FOR PRECISION WORK

Special Boring Bars

EQUIPPED WITH STANDARD MICROBORE TOOLS

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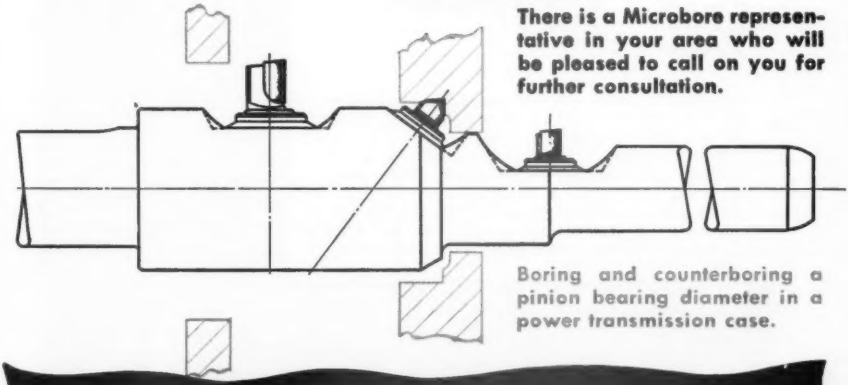
TURNING ●
FACING ■

Each tool independently adjusted by proven micrometer, vernier principle.



Boring and counterboring a pinion bearing diameter in a power transmission case.

There is a Microbore representative in your area who will be pleased to call on you for further consultation.

DeVLIEG MICROBORE COMPANY
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STANDARDIZE

on

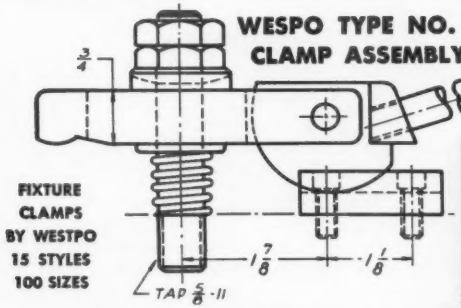
WESPO

CLAMPS and FIXTURE PARTS

Template Drawings of all Clamps and Parts sent on request.

Order COMPLETE CLAMP ASSEMBLY or any COMPONENT PARTS

WESPO TYPE NO. 1 CLAMP ASSEMBLY



BELOW—PARTS OF TYPE No. 1

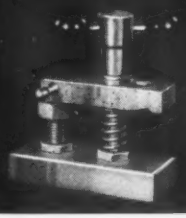
FIXTURE CLAMPS BY WESTPO 15 STYLES 100 SIZES

WESPO Clamps are carefully designed to meet the needs of Fixture Designers—Tool Makers—Machinists. Made of heat treated alloy steel rust-proofed.

There is a WESPO Clamp Assembly to suit every job—15 types—100 sizes. Also over 350 standard fixture parts and fittings.

Standardize on WESPO Fixture Clamps and Fittings. Save designing time—save tool room time. Full scale Template drawings of fixture clamps and parts are sent on request—Write for catalog.

Model 4 Clamp



HIGH TENSILE STUDS HT. CP

WEST POINT MFG CO.

26935 W. 7 MILE ROAD, DETROIT 19, MICHIGAN

OVER 350 FIXTURE PARTS
WRITE FOR CATALOG

. . . with dies made of Graph-Mo steel

STAMPING out stainless steel parts for medical sterilizers was causing trouble for the Pelton & Crane Company, Detroit. The dies they were using—made of an ordinary tool steel—became worn after only a few hundred stampings. Holes in the parts were ragged, requiring polishing. The punches were continually chipping and cracking.

Then they tried dies made of Graph-Mo—one of four Timken® graphitic tool steels. After 12,000 stampings, the Graph-Mo dies still showed no signs of wear. Stampings were clean and smooth. No polishing was needed. Pelton & Crane reports: "The fact that Graph-Mo stands up on stainless steel, where other types we used continually broke down, leads us to believe there is no finer tool steel on the market than Graph-Mo."

Graph-Mo offers many advantages in dies and punches. Because of free graphite in its structure, Graph-Mo has minimum tendency to scuff or gall. Because it contains diamond-hard carbides, it offers unusual resistance to wear. Graph-Mo has excellent stability. Surfaces may be finished to precision tolerances. Machining is far easier than with ordinary tool steels. And Graph-Mo's uniform response to heat treatment prevents distortion in hardening.

For further information, write on your company letterhead for new, 10th edition of Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN
Fine Alloy
STEEL
and Seamless Tubes

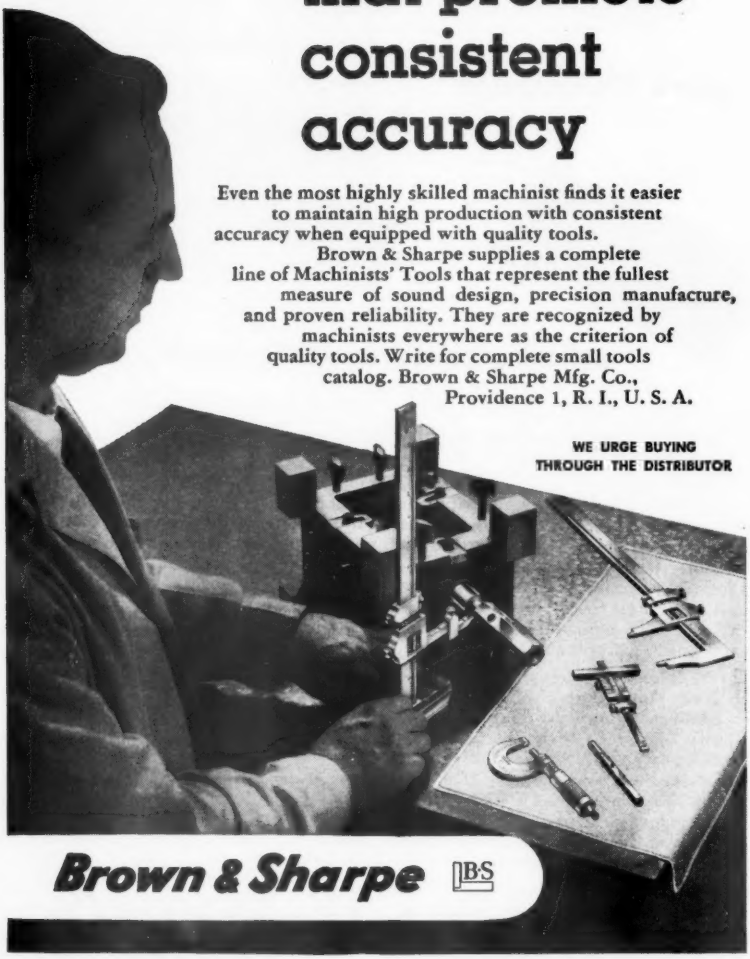
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

fine tools that promote consistent accuracy

Even the most highly skilled machinist finds it easier to maintain high production with consistent accuracy when equipped with quality tools.

Brown & Sharpe supplies a complete line of Machinists' Tools that represent the fullest measure of sound design, precision manufacture, and proven reliability. They are recognized by machinists everywhere as the criterion of quality tools. Write for complete small tools catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR



Brown & Sharpe B·S

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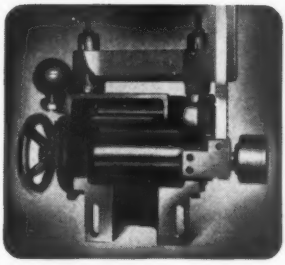
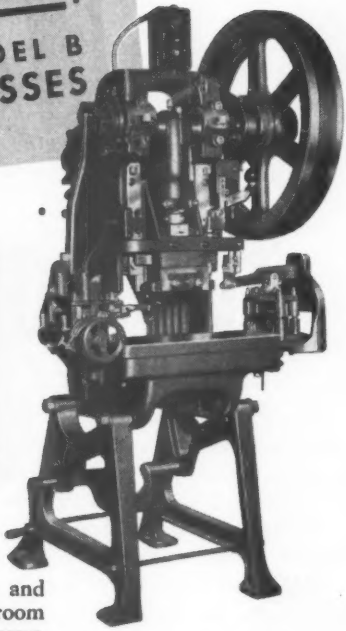
More Press Capacity

PERKINS MODEL B INCLINABLE PRESSES



Single Feed Roll



Round out your press capacity and boost the efficiency of your press room with these efficient, versatile presses. Protect your press operators and increase production with the use of Perkins Feed Rolls.

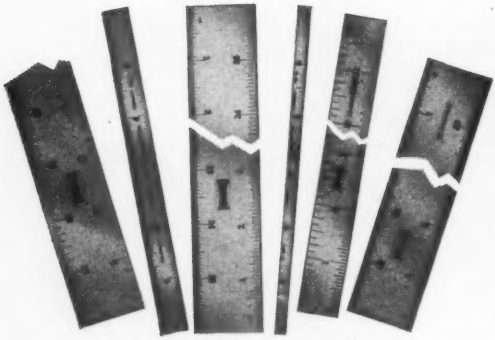
This No. 351 Model B Inclinable Press with 20 ton capacity, has single feed roll and adjustment for stock line, accurate overrunning clutch and top roll lift. Will feed stock 6″ wide to a length of 0″ to 8″. Write for bulletin.

PRESSES BUILT TO SPECIAL SPECIFICATIONS

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS



TUMICO
Steel Rules

Accurately ground and graduated with dark, contrasting, easily read lines and numbers. Made from spring tempered steel, rigid, semi-flexible and full flexible. Many combinations of English, Metric or English-Metric graduations. Special rules and scales made to specifications. Write for free catalog.

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA
SEATTLE • LOS ANGELES • DENVER • DALLAS • CHICAGO • MINNEAPOLIS • KANSAS CITY
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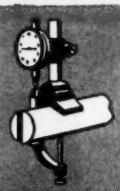
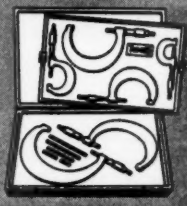
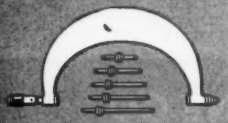
FOR EVERY JOB
TUMICO
PRECISION MEASURING INSTRUMENTS



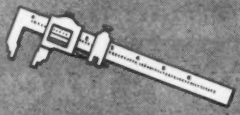
TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



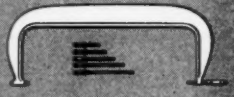
TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.



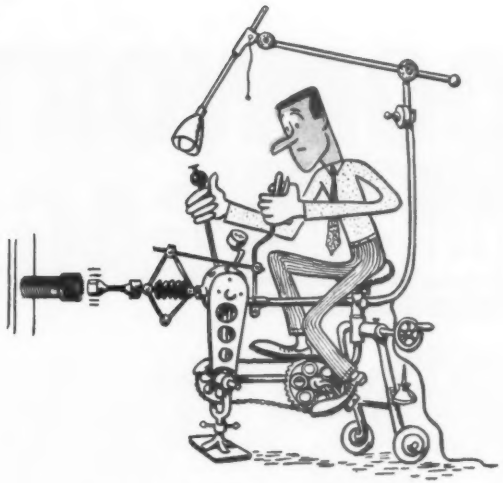
TUMICO
OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3" to 28".



TUMICO VERNIER CALIPERS
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6" to 48".



TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".



WHY GET INVOLVED...

in special design, drawings, tools, parts or any other "specials"? They almost always *increase costs, delay deliveries, reduce profits—"put you in the RED"*

Whenever you use socket screw products—be sure you're not specifying "specials" where "standards" will do. Let us tell you how UNBRAKO Standard Socket Screw products—stocked by your local UNBRAKO Distributor—can help to *"keep you in the BLACK"*. They're listed and described in our booklet, UNBRAKO "STANDARDS". Write for your copy today.

STANDARD recommends UNBRAKO® "Standards"

Knurled Head Socket Cap Screws
Flat Head Socket Cap Screws
Self-Locking Socket Set Screws
Knurled Head Shoulder Screws
Precision-Ground Dowel Pins
Fully-Formed Pressure Plugs

SPS STANDARD PRESSED STEEL CO.
JENKINTOWN 36, PENNSYLVANIA

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WOODWORTH

Nawlide GAGES

The surface hardness of Woodworth NAWLIDE Gages is equivalent to that of Tungsten Carbide gages . . . and the cost per gage is one third as much! . . . In other words, NAWLIDE Gages will check three times as many parts per dollar as any other gage. . . . These laboratory and shop test statistics were furnished by Woodworth customers. . . . It will be profitable for you to write for details and investigate NAWLIDE. . . . Why don't you compare Woodworth NAWLIDE Gages with any other gage on the market today?

Accuracy you can trust

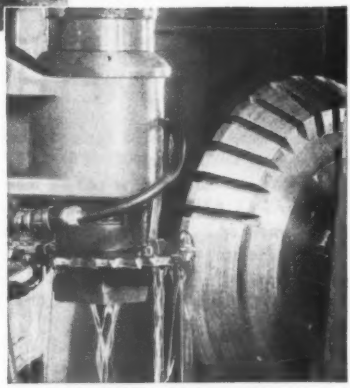
WOODWORTH

N. A. WOODWORTH CO. • 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOK JIGS • PRECISION PARTS

Slotting INGERSOLL Cutters 3 TIMES FASTER

Feeding 15" per minute on a slot 1/2" wide and 1" deep in a chrome-molybdenum cutter housing.



● The benefits of Ingersoll engineering and our facilities for building good cutters economically are two of the reasons why users of Ingersoll cutting tools are at a special advantage.

This Ingersoll Special Design Cutter Slotter machines cutter housings in one-third the floor to floor time required by previous methods. Together with many other modern machines in our shop, it has made possible a large increase in the production of Ingersoll milling and boring cutters to meet the combined needs of defense tooling programs and the civilian economy.

Send for Catalog 56 describing Ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

THE INGERSOLL MILLING MACHINE COMPANY • ROCKFORD, ILLINOIS

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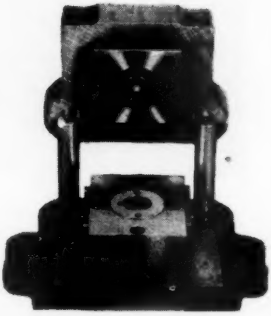
"A MUST wherever WASHERS are made!"

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE-MINUTE METHOD

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.



Made in 5 sizes:
¼"—1½"—2½"—4"—6".

Write for literature.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD **VAN DYKE, MICHIGAN**
Phone: Slocum 7-1334 **Suburb of Detroit**

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

3 Simple "Moves" Show How VERSATILE DELTA TOOLS Solve Production Problems...

1 MOVE THE OPERATOR

To make it easy for the operators of a long-table multiple spindle Delta drill press to move from one work station to another, Albertson and Company, Sioux City, Iowa, devised roller seats that travel on rails. When one man completes his series of operations he passes the work to the next man. Operators can travel the full length of the table with a minimum of fatigue.

2 MOVE THE TOOL

To make easier work of drilling holes in a large, extremely heavy bath-tub casting, Racine Pattern Works, Racine, Wisconsin, mounted a Delta 17-inch drill press on a three-legged spider base, in place of the regular base. Now the casting remains stationary, and it is an easy, simple operation to slide the drill press into several positions for drilling holes in the flange of the casting.

3 MOVE THE WORK

To speed up eleven operations on an aluminum grid casting—including drilling, reaming, counterboring, countersinking—Sangamo Electric Co., Springfield, Ill., uses a Delta 15-foot sectional table and eleven Delta 17-inch drill presses for the individual operations. The casting moves from one machine to the next; and a great deal of costly trucking and handling is eliminated.

These applications are typical of the cost-cutting set-ups devised by Delta users; and illustrate the extraordinary adaptability of Delta tools to unusual production needs.

There's a Delta Power Tool for Your Job – WOOD OR METAL WORKING

83 MACHINES—246 MODELS—MORE THAN 1300 ACCESSORIES

Your Delta dealer is listed in your Classified Phone Directory under "Tools"

DELTA MILWAUKEE

DELTA POWER TOOL DIVISION
Rockwell MANUFACTURING COMPANY
613N E. VIENNA AVENUE • MILWAUKEE 1, WISCONSIN

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Here's help for Housewives..

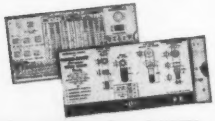
P-K
TRADE MARK
REG. U.S. PAT. OFF.

According to worker supply forecasts, your assembly lines will soon be "manned" by more and more housewives.

Whether housewives or not, any "green hands" on Socket Screw assembly jobs will learn faster and work faster with P-K* Size-Marked Gear Grip Socket Head Cap Screws.

The clearly readable Size-Mark prevents confusion and errors—saves a lot of lost motion. It's a help in the tool crib, too, where left-over, mixed screws can be easily sorted. And the Gear Grip means non-slip starting, speeds the job.

No wonder these time-saving, top quality Socket Screws are wanted, in tremendous quantities, for more of industry's finest products than ever before. P-K production is going 'round-the-clock to meet this mounting demand. For D.O. or other assemblies set your standards by P-K quality. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y. Sold through Accredited Distributors.



MORE HELP FOR ASSEMBLY PLANNERS

The New
P-K Socket Screw Dimension Finder

A pocket-size plastic slide chart gives you all essential dimensions of P-K Socket Cap Screws, Set Screws, Flat Head Screws, Stripper Bolts, and Pipe Plugs. Includes Set Screw Point Dimensions, and Thread Length Formula. Available, FREE from your P-K Distributor.

PARKER-KALON*
cold-forged
SOCKET SCREWS

SIZE-MARKED SOCKET HEAD CAP SCREWS • GROUND THREAD SOCKET SET SCREWS
FLAT HEAD SOCKET CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS
* TRADE MARKS REG. U.S. PAT. OFF.

RIVETT ***INTERNAL GRINDER HAS DOUBLE-END WHEELHEAD***

On the Rivett Model 1024 you can grind holes ⅛″ to 9″ dia. and plug gauge to 6″ depth. A double-end wheelhead swiveling 180° converts this versatile internal grinder to a universal machine—handling internal and external work to 12″ dia. and 18″ length with equal ability. Toolmen using the 1024 are amazed at the reduction in set-up time.

Internal spindles available for speeds from 6000 to 35,000 R.P.M.—External spindle has double row roller bearings for radial load and ball bearings for end thrust—Double swivels on cross slide for two angle internal and external grinding—Workhead spindle mounts draw-in collets directly.

WRITE FOR BULLETIN 1024 A.

RIVETT **LATHE & GRINDER, Inc.**

Dept. TPR-12, Brighton 35, Boston, Mass.

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

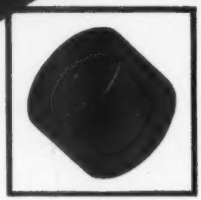
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Maurice Tirone: Heat Treating Foreman at THE ABBOTT BALL COMPANY says: —

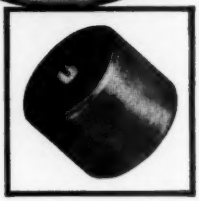
HOURS OF POLISHING TIME SAVED - - SCALE, PITTING AND DECARBURIZATION ELIMINATED WITH . . .
ABBOTT
ARE COLD HEADED FROM MIRROR-LIKE-DIES — HARDENED AT PROPER HEAT, NOT EXCEEDING 1600°F. USING

PHOENIX BRAND
TRADE MARK REG. U.S. PAT. OFF.

NON-SCALING COMPOUND



Above is shown a test cold heading, steel ball die after ordinary heat treating. Note surface discoloration, pitting and scale. Even after costly polishing operation, this die would probably be rejected.



Here is a hardened cold heading die Heat Treated with PHOENIX BRAND NON-SCALING COMPOUND. Note clear smooth scale-free surface. Saves TIME, saves money and of course better dies *last longer.*

"I have had over 16 years experience in Heat Treating," says Maurice Tirone, "and believe me the manufacture of steel balls is an exacting business. We used to reject 20% of all heading dies because of surface pitting or excess scale during heat treating.

"Now, with PHOENIX BRAND NON-SCALING COMPOUND we can harden up to twenty pieces in one furnace at one time . . . no scale — no pitting — no rejects and *every die* produces perfect ABBOTT BALLS."

Phoenix Brand Compound is easy to use — it goes on dry — solves heat treating problems — virtually eliminates costly polishing.

AT YOUR MILL SUPPLIER

WRITE for Literature and information and address of Mill Supplier nearest you.

A Product of:

Parker

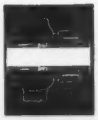
THE PARKER STAMP WORKS, Inc.
Established 1871
HARTFORD, CONNECTICUT

A DRILL FOR EVERY PURPOSE
Drilling metals or materials of every kind becomes simple, when the right drill for the job is selected from among the many types manufactured by WHITMAN & BARNES. No single kind will answer all requirements.
There are SPECIFIC types of W&B Drills for drilling:—
NON-FERROUS METALS
STAINLESS STEEL
STEEL FORGINGS
MONEL METAL
TOOL STEEL
SOFT STEEL
CAST IRON
CONCRETE
ALUMINUM
BAKELITE
BRONZE
BRASS
GLASS
WOOD
Wood Bit with ¼" shank. Will fit Electric Drill with ¼" chuck
Power Auger Bit with ¼" shank. For use in Electric Drills
Hand Auger Bit. For Wood
Carbide Tipped. For drilling hardened steel
Carbide Tipped. For drilling Concrete, Cement, Brick, Slate, Marble, Stone, etc.
Carbide Tipped. For drilling Glass.
Carbide Tipped. Straight Shank. For drilling Cast Iron, Bronze and Non-Ferrous Metals.
Carbide Tipped. Taper Shank. For drilling Cast Iron, Bronze and Non-Ferrous Metals.
Short Length for Screw Machines.
Combined Drill and Counter sink. For centering holes in Metal.
Short Length Drill with ¼" Shank. For use in ¼" Electric Drill or Drill Press For Metal or Wood
Straight shank with ½" Dia. Shank. For use in ½" chuck capacity Electric Drill
For Aluminum, Die Cast Metal, Copper, Slate, etc.
For Bakelite, Brass, Fiber, Hard Rubber, Plastics, etc.
Straight Shank. For General Purpose Drilling. Also Heavy Duty for Steel Forgings
Taper Shank. For General Purpose Drilling. Also Heavy Duty for Steel Forgings
Illustrated here are only a few of the many types regularly manufactured for stock and sold at regular prices. For complete information on all styles—reference should be made to catalog No. 102.
Contact your local W & B distributor.
W&B
"Makers of Fine Tools Since 1845"
WHITMAN & BARNES
PLYMOUTH, MICHIGAN
NEW YORK • CHICAGO • LOS ANGELES • HOUSTON

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

SOUTH BEND

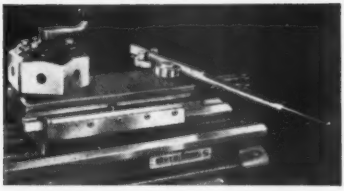
SERIES 1000 *PRECISION* TURRET LATHE



1" COLLET CAPACITY

1-3/8" SPINDLE BORE

This precision turret lathe meets the demand for fast, efficient production of small precision parts. It has the accuracy for close-tolerance operations; ample power for smooth performance; and rigidity for producing a fine finish. Especially practical for second operation work of many types.



HANDLEVER BED TURRET

Turret will index within plus or minus .0005" at 4" from turret face. Turret head may be back-indexed or spun to skip tool positions. Individual feed-stop screws. Maximum distance between spindle nose and turret face is 19-3/8" at start of indexing.

SEND INFORMATION CHECKED:

☐ _____

_____

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-36" FLOOR LATHES

☐ 1½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES

☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • SOUTH BEND LATHE • South Bend 22 Indiana

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

New 2½ inch Hitch Feed takes industry by storm

Dickerman 2½ in. HITCH FEED

Designed for mounting directly on die set—though it may be attached to bolster. Has wider range, greater control. Handles stock up to .050" thickness. Handles intricate multi-station dies as well as everyday blanking and piercing dies.

No tools are required for adjustments. Carbide wearing and gripper plates assure years of service.

Introduced six months ago, the Dickerman 2½" Hitch Feed has already established itself as a top favorite. Repeat orders for this Feed are positive proof of the performance and service you can expect.

Write today for further details . . . see for yourself.

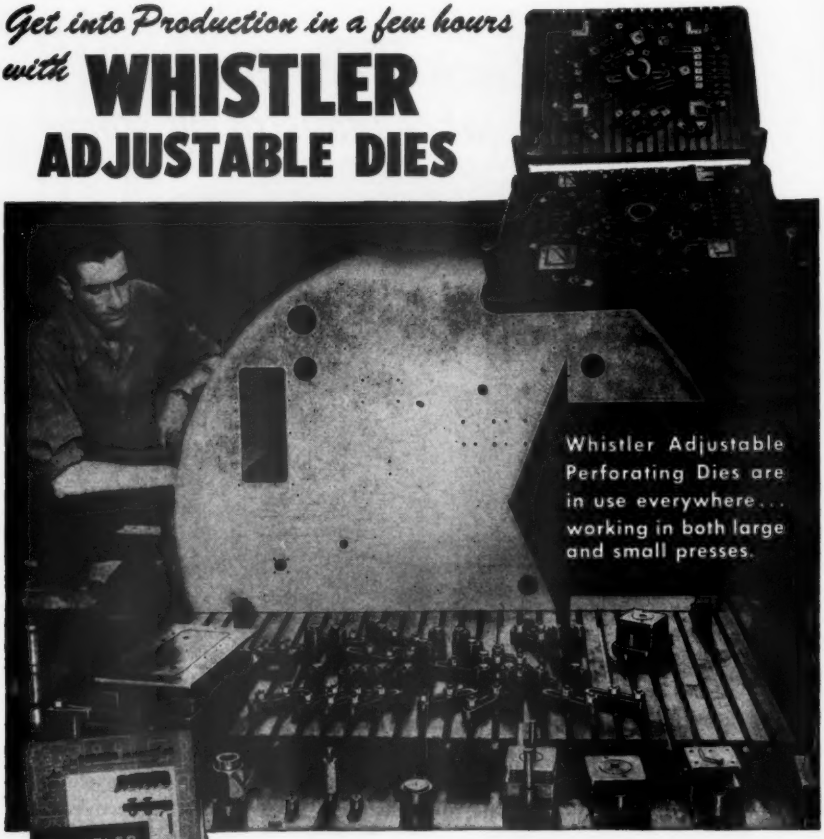
H. E. DICKERMAN MFG. CO.

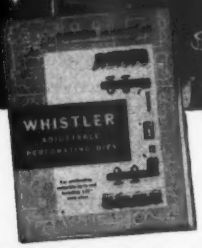
Dept. L 328 ALBANY STREET SPRINGFIELD, MASS.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Get into Production in a few hours with

WHISTLER ADJUSTABLE DIES





There are plenty of other advantages in using Whistler Adjustable Dies. It makes sense to get the complete story. And it's easy to do. Write for your Whistler Catalog today.

Whistler perforating dies now offer a double-barreled advantage in getting into production faster. Standard sizes of round hole punches and dies... 1/32 to 3"... can be shipped promptly. Special shapes... squares, ovals, rectangles, group and notching dies, are quickly made to order.

Equally important, set-ups are simple... take only a short time. Same units can be rearranged or units added in setting up different jobs. Production is thus speeded while die costs are amortized through continued re-use. No special tools are needed. All parts are interchangeable. The heavy duty series of punches and dies easily pierce materials up to 1/4" mild steel.

S. B. WHISTLER & SONS, INC.

748 MILITARY ROAD • BUFFALO 17, NEW YORK

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

"Handiest Machine in the Shop"

PRATT & WHITNEY
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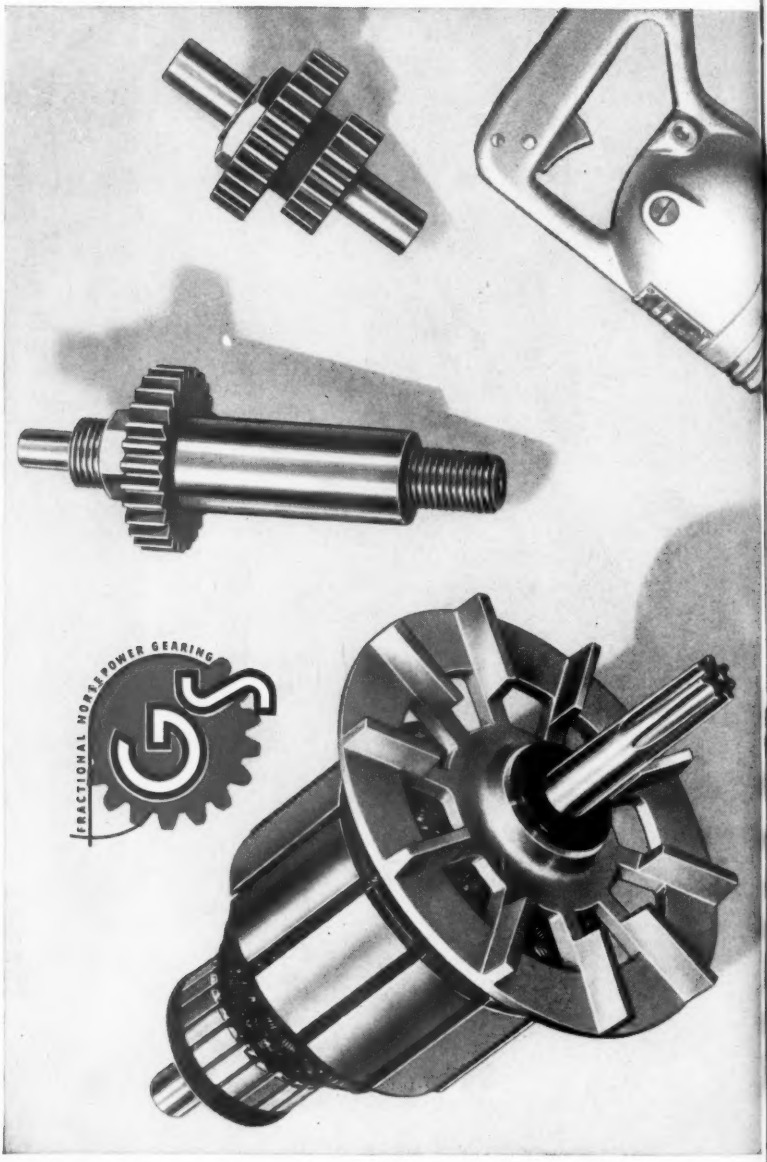

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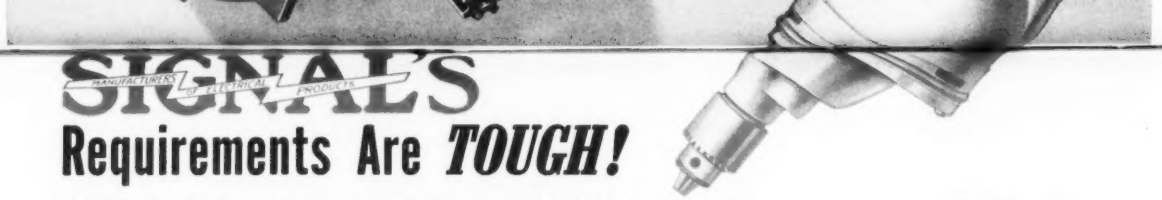

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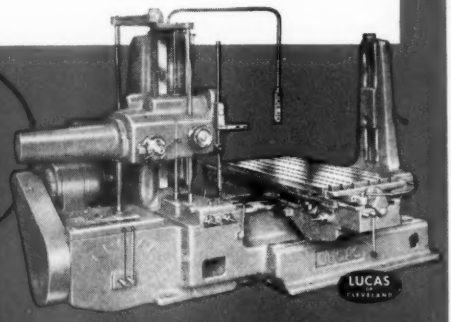

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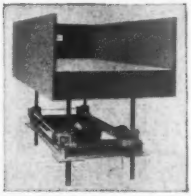

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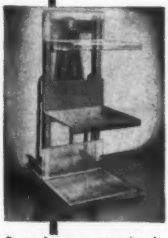

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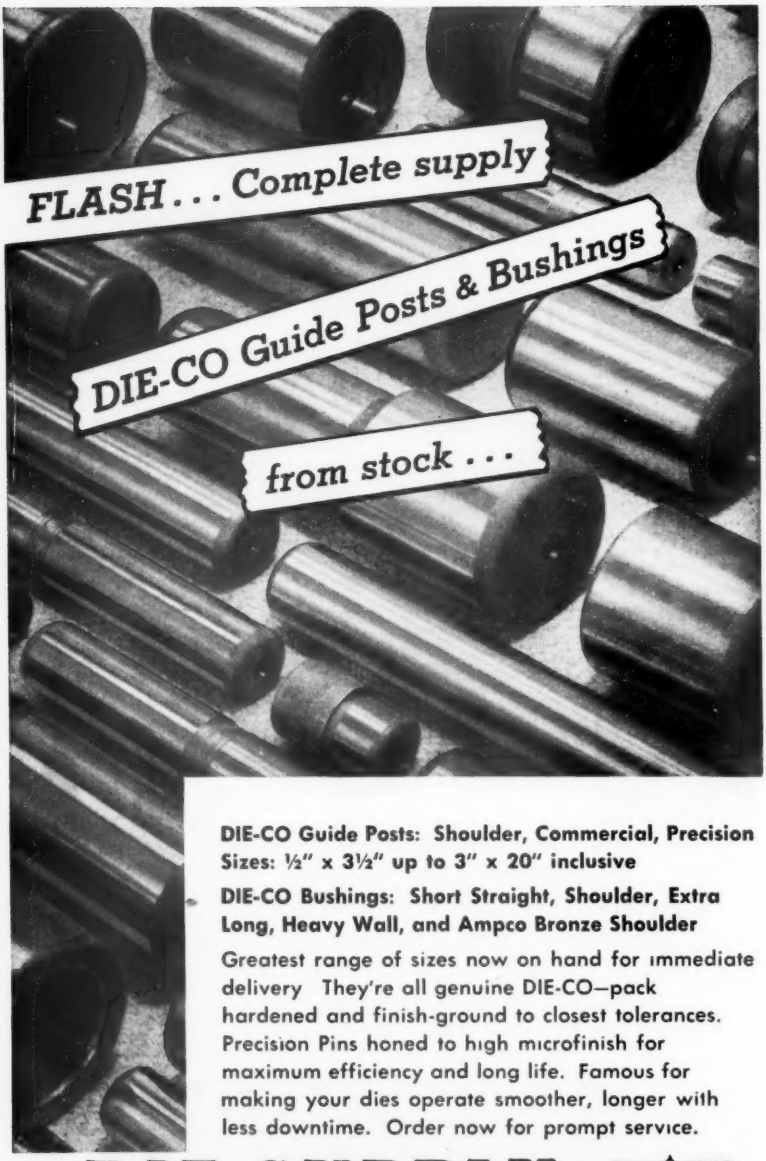

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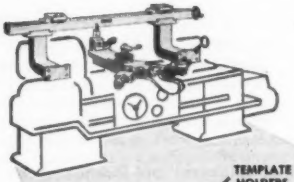

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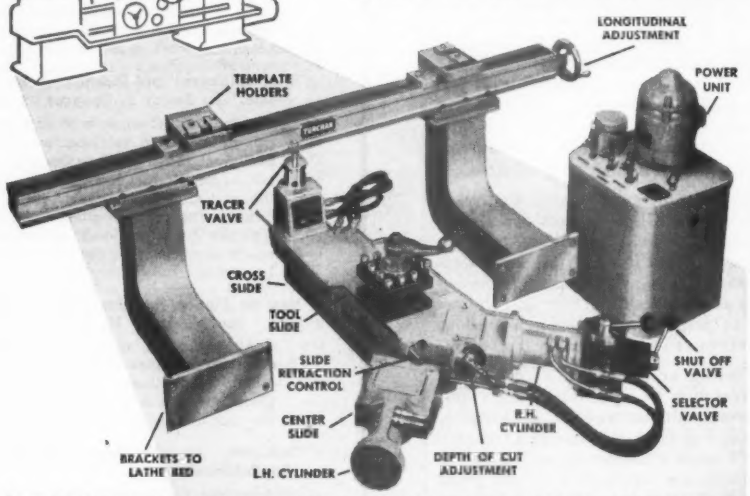

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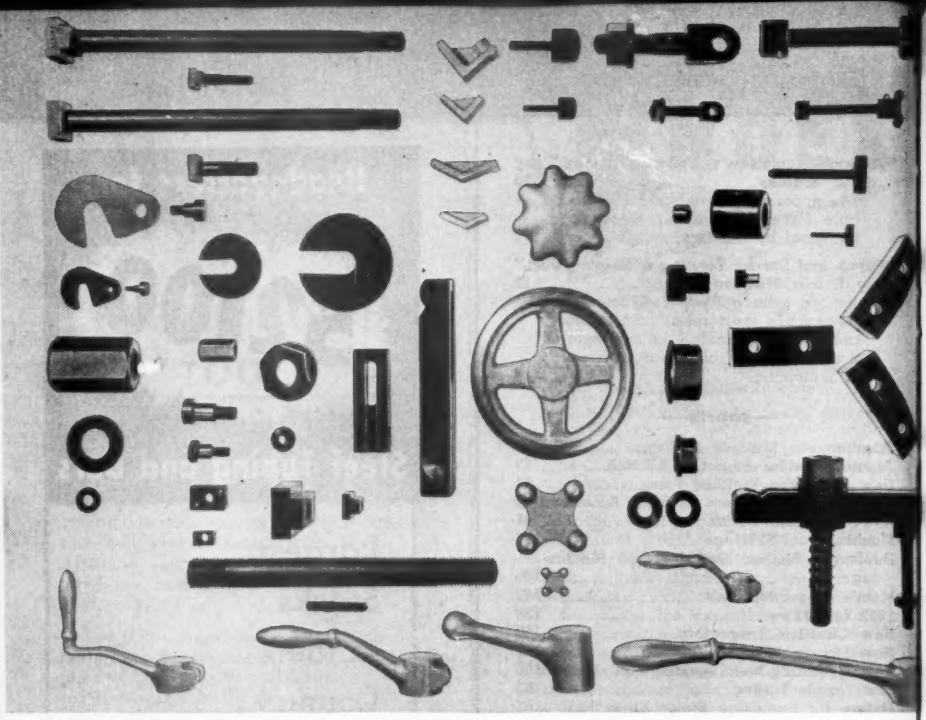

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editorial

slots and slots

The attending of meetings, conventions and exhibitions is a necessary editorial activity. As we hear papers read and see demonstrations made, it enables us, in our field of TOOLING and PRODUCTION, to keep abreast of tooling and head of production.

This means that as we observe the trends in TOOLING and special machine developments, as we are told of new methods being readied for disclosure and application, we are able to translate and anticipate these things in terms of PRODUCTION.

We are able to see how things are going to be made (PRODUCTION) because we see the new things (TOOLING) that will be employed to make them. Thus we can steer our editorial efforts to insure bringing to our readers authoritative articles of the greatest import and timeliness covering new and proved ways of putting tooling to work in order to attain production.

A few days ago, we devoted a fascinating few hours to putting the cart before the horse. At this gathering there was no tooling on display, no production machines turning out more and better workpieces. The exhibits were made up of the finished products, so we had to "work backwards" in our thinking in order to visualize the TOOLING and PRODUCTION which had come before.

Last week Cleveland was host to the National Automatic Merchandising Association's annual convention and exhibition. This represents a business that rings up hundreds of millions of dollars in annual volume simply because it has been made so attractive and easy for you to put a penny, nickel, dime or quarter in a slot and receive in return a scoop of peanuts, a cup of coffee (with or without cream), a squirt of perfume, a bright, shiny, red apple, a box of Kleenex, or a copy of the current Reader's Digest.

These machines are most ingenious, and many of them involve precision design and manufacture in keeping with an automatic screw machine. They are fully representative of the metalworking crafts; large sheet metal formed areas, die castings, welded bases, screw machine products; all combined with subassemblies involving motor drives, indexing devices, automatic valving (coffee, with or without), gear trains, chain conveyors (automatic cycling, and electronic controls, to say nothing of colored illumination and decorative effects to make it easy and painless to part with your coins.

The exhibits fell in two categories; the machines for automatically vending merchandise, and the merchandise that is vendable by machine; candy bars, cigarets, fruit, soft drinks, ice cream sticks, gum and peanuts.

The whole array was an inspiring commentary on precision manufacture; the machines themselves which have to perform thousands and thousands of uniform operating cycles, unattended except for periodic refilling, and the merchandise that must be manufactured and packaged to close tolerances to insure uniformity to insure repetitive and accurate dispensing.

The machines and the industry they symbolize are symbolic of free enterprise. It could only happen in this country, where any bright young boy can aspire to be President or to garner a number of choice locations and set up his chain of automatic stores.

So you can see there are no dull moments in the editorial business, and now, to all of you from all of us,

A Merry Christmas and a Happy New Year.

E. Willard Pennington

editor

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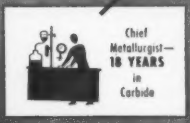
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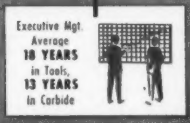
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Magnet Yokes Made Rapidly on High Precision Basis

Here are the exceptional setups which perform blanking, deburring, tapping, forming, projection welding and broaching operations on large quantities yet hold the close dimensions essential for a quality product.

by **Herbert Chase, M.E.**
Forest Hills, New York

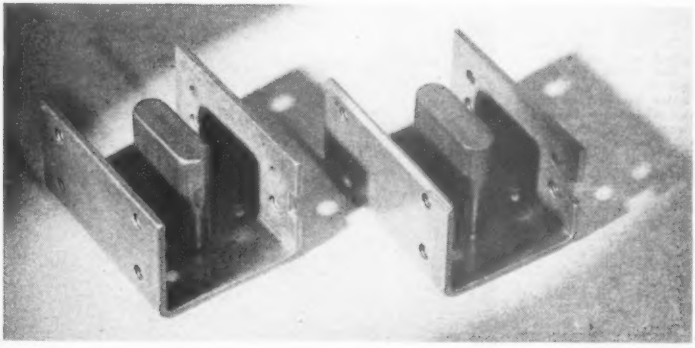
The production of magnet yokes of the type illustrated in Figure 1 may appear to involve no unusual problems when the assembly itself is viewed superficially. But when exacting specifications, such as that which requires holding top faces parallel within ±0.001 inches and keeping them within ±0.001 inches of the same height are considered, production is soon found to involve more problems than might be expected.

In any event, the setups employed by International Business Machines Corporation's Endicott, New York, plant to produce these yokes are deserving of careful study. The yokes are required in large quantities and are made in several different designs in a plant area used entirely for this purpose. Some machines made by this company employ scores of these yokes and, as proper functioning of these machines depends in considerable degree upon precise and uniform yoke construction, the pains taken in their manufacture are amply justified. So also are the excellent tools employed.

Blanking is done from coil stock 0.062 inches thick and of whatever width is required in a No. 6 Minster press, using a blank and pierce die such as appears in Figure 2. This press is equipped with rolls for straightening the stock and a U. S. Tool Company slide feed is employed. Some burrs are produced by the dies and, as no burrs can be tolerated, all blanks undergo a wet abrasive tumbling operation in rubber-lined barrels before further processing.

Several of the holes pierced have to be tapped and this is done in the Bodine setup, Figure 3, using a dial feed. Loading is by hand, locating over pins in holes that are not to be tapped, but all other operations, including ejection, are automatic. Six spindles are used for a piece like that shown in Figure 1, one hole being tapped as each piece stops

Fig. 1. These simple yoke assemblies, whose production is described in the text, have to be made with care to hold certain close and critical dimensions. Assemblies are shown before and after broaching top faces and edges.



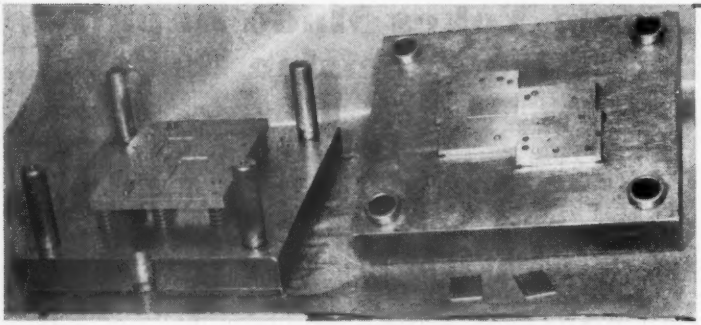


Fig. 2. Die employed for shearing and piercing coil stock to produce the blanks, lower right, from which yokes are formed in a later operation.

under each spindle. This machine taps the six holes in 11,000 pieces per shift.

Tapping throws burrs above the faces of the piece and they have to be removed before further processing. This was done for a time by hand on an abrasive belt but was too slow (350 to 400 pieces an hour) and not always satisfactory, hence the special machine shown in Figures 4 and 5 was developed to do the job on a semi-automatic basis at the rate of 36 pieces a minute.

In this machine, a No. 60 abrasive belt is used but it runs over rubber pulleys with the abrasive face inside at a surface speed of 1500 fpm. Four idlers, running on the outside of the belt, guide two faces so that they run parellel and are spaced apart by about the thickness (0.062 inches) of the blanks to be deburred. To feed the blanks, they are placed in the mating recesses of a steel disc made from 0.050-inch stock and arranged to turn at 3 rpm above a table flush with the bottom of the disc.

As the disc turns, it carries the work-pieces through the space between the abrasive faces of the belt. The belt faces are pressed together by a spring loaded pad that rides on the outer side of the belt. There is a fixed backing plate under the belt. As the work-pieces

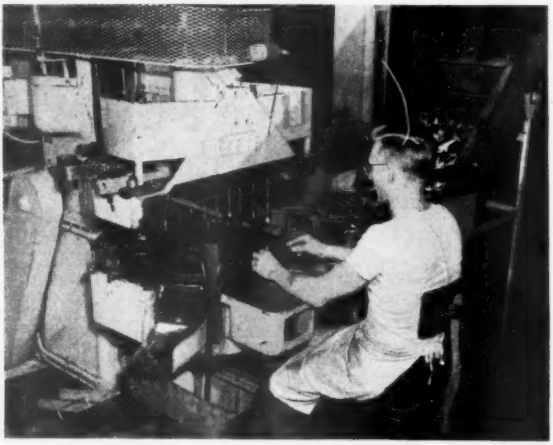


Fig. 3. This machine, equipped with an indexing dial feed, is employed to tap each of six holes pierced in the blanks which are loaded by hand over locating pins. Eleven thousand pieces are tapped in eight holes.

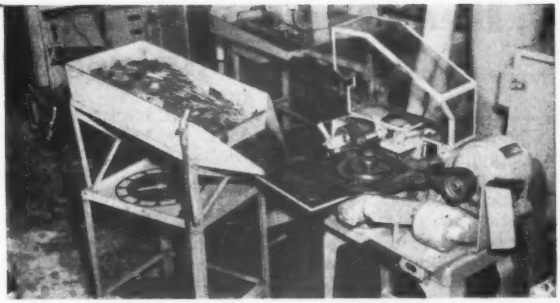


Fig. 4. Special dial feed machine employed to grind off burrs left by tapping holes in yoke blanks. The dial (shown with guard lifted) carries blanks between abrasive faces of the belt.

pass under the pressure pad, the belt is pressed against both surfaces and the burrs are ground off.

The circular dial discs are subject to some abrasion but, being, when new, 0.012 inches thinner than the work-pieces, they are subjected to little pressure and last long enough to deburr about 100,000 work-pieces before being scrapped. Recesses in the discs are cut out with a saw after pasting contour drawings of the work-pieces on the face, and commonly are twelve in number. In some cases, two pieces instead of one are placed side by side in each disc recess.

The work-pieces feed down a chute onto a table flush with the top of the disc and are very easy to load because the disc turns so slowly. As Figure 5 indicates, guards cover the belt and most of the disc, hence safe operation is assured. After the work-pieces are carried by the disc out from between the belt faces, the pieces drop out through a hole and slide down a chute into a tote box. All the operator does is to feed pieces into the disc recesses as the latter come into loading position. Belts last for about one day's run of eight hours.

After this deburring, the work-pieces are transferred to a No. 4 V & O press setup, Figure 6, and are fed by hand to the forming die that converts them to U-shape. At the end of each working stroke, the workpiece is forced down against two short fixed punches in the die and these extrude projections upward into recesses in the forming punch. As the latter makes its up stroke, the formed piece is stripped off and is ejected by an air jet. The die used is a precision type and locates the work-piece accurately at each end so that, after forming, the ends will be as nearly parallel and at as near the same height as is feasible in die forming. This forming operation makes the work-piece ready for welding to the core.

Cores are produced from flat bars drawn with half-round edges. Bars are cut to length in a milling machine with their ends truly square and then are burred by wet abrasive tumbling long

(Continued on page 55)

Fig. 5. Operator feeding blanks to the same machine shown in Figure 4. Blanks are placed in recesses of the dial as it rotates at only 3 rpm. After passing between belt faces, blanks drop into tote box.

Heat Treatment and Pickling of the Stainless Steels

Introduction

The stainless steel group covers a large number of different compositions as is aptly illustrated in Table I; each of which has been formulated to meet a specific set of conditions. The inherent properties of the stainless steels which are familiar to most laymen are its corrosion- and heat-resistance; the degree of immunity exhibited being in direct proportion to the alloy content within the specific composition. With a chromium content of approximately 12.0 percent, normal atmospheric conditions are sufficiently oxidizing to promote the formation of a protective film[10], so that with this chromium content stainless steel resists corrosion in normal atmosphere or under similar conditions.

by **Lester F. Spencer**
Chief Metallurgist
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As the conditions of service becomes less and less oxidizing, successively higher chromium contents are necessary in order to promote the formation of a protective film. Thus, under a given set of corrosive conditions, as the chromium content is gradually increased, resistance to attack does not increase gradually[10], but occurs abruptly at the chromium content sufficiently high to allow the formation of the protective film.

Resistance to scaling is dependent upon the formation of a tightly adherent refractory oxide film. Under normal atmospheric conditions, the alloys containing 12.0 percent chromium will resist scaling at temperatures up to 1400° F. When the chromium content is raised, this resistance to scaling is obtained at higher temperatures.

Thus, the ferritic stainless, type 446, which contains from 23.0 to 27.0 chromium has heat resistance up to 2000° F., however a disadvantage of this composition is the loss of impact toughness at elevated temperature. Also, the austenitic stainless, types 309 and 310, are primarily heat resistant grades in which the chromium content is sufficiently high to obtain resistance to scaling up to approximately 2000° F., with sufficient nickel to keep the alloy in the austenitic condition and thus overcome the disadvantages already mentioned[10] for the type 446 stainless composition.

Of the two compositions, type 310 generally gives better service due to its lower coefficient of expansion, resulting in that the protective scale will not flake off as readily during rapidly fluctuating temperature service.

The stainless steels can be divided into two major groupings; those that contain both chromium and nickel as major alloying elements, and those that contain chromium as the major alloying element. The former group, known as the A.I.S.I. 300 series and often referred to as the 'austenitic' stainless, are nonhardenable by a standard heat and quench procedure so commonly employed for the lower alloyed steels. However, a wide range of mechanical properties can be realized by cold working these alloys.

The latter group of alloys mentioned, known as the A.I.S.I. 400 series can be further classified according to hardenability. Thus, the group of stainless compositions such as A.I.S.I. types 403, 410, 416, 414, 431, 420 and the 440 series are known as the 'martensitic' group; these steels exhibiting good hardenability upon normal heating and quenching procedures.

Within this group are also types A.I.S.I. 501 and 502 even though the alloy content is much lower than in those alloys previously mentioned.

Those compositions known as the 'ferritic' stainless are exemplified by A.I.S.I. types 405, 406, 430, 430F and 446. These compositions exhibit little or no hardenability upon quenching.

Since corrosion resistance is usually the prerequisite in the choice of a stainless composition, it is well to state the

TABLE I CHEMICAL COMPOSITIONS AND OUTSTANDING CHARACTERISTICS OF THE STANDARD TYPES OF STAINLESS STEELS

Type	CHEMICAL COMPOSITION PER CENT						Outstanding Characteristics
	Carbon	Manganese*	Silicon*	Chromium	Nickel	Other Elements	
301	Over 0.08-0.20	2.00	1.00	16.0-18.0	6.0- 8.0	.....	Strongly work hardening.
302	Over 0.08-0.20	2.00	1.00	17.0-19.0	8.0-10.0	.....	Greater corrosion resistance and less work hardening than Type 301.
302B	Over 0.08-0.20	2.00	2.0/3.0	17.0-19.0	8.0-10.0	.....	Silicon addition gives good corrosion and oxidation resistance.
303	0.15*	2.00	1.00	17.0-19.0	8.0-10.0	P,S, Se-0.07** Zr, Mo- 0.60*	Free Machining grade.
304	0.08*	2.00	1.00	18.0-20.0	8.0-11.0	.....	Less heat sensitive than other 18-8 steels; used where heat is encountered.
305	0.12*	2.00	1.00	17.0-19.0	10.0-13.0	.....	Minimum work hardening; useful in spinning applications.
308	0.08*	2.00	1.00	19.0-21.0	10.0-12.0	.....	Highly resistance to corrosion and oxidation.
309	0.20*	2.00	1.00	22.0-24.0	12.0-15.0	.....	Similar to Type 308 but superior.
310	0.25*	2.00	1.50	24.0-26.0	19.0-22.0	.....	Superior to both 308 and 309 in corrosion and oxidation resistance.
314	0.25*	2.00	1.5/3.0	23.0-26.0	19.0-22.0	.....	Similar but superior to Type 302B.
316	0.10*	2.00	1.00	16.0-18.0	10.0-14.0	Mo-2.0/3.0	Better corrosion resistance to pitting.
317	0.10*	2.00	1.00	18.0-20.0	11.0-14.0	Mo-3.0/4.0	Similar but superior properties to type 316.
321	0.08*	2.00	1.00	17.0-19.0	8.0-11.0	Ti-5xC**	Stabilized; welding application.
347	0.08*	2.00	1.00	17.0-19.0	9.0-12.0	Cb-10xC**	Stabilized; welding application.
403	0.15*	1.00	0.50	11.5-13.0	.....	.....	Turbine Quality.
405	0.08*	1.00	1.00	11.5-13.5	.....	Al-0.10/0.30	High dimensional stability.
406	0.15*	1.00	1.00	12.0-14.0	.....	Al-3.5/4.5	Excellent resistance to high temperature oxidation.
410	0.15*	1.00	1.00	11.5-13.5	.....	.....	Similar to type 403.
414	0.15*	1.00	1.00	11.5-13.5	1.25- 2.5	.....	Ni addition for toughness.
416	0.15*	1.25	1.00	12.0-14.0	.....	P,S, Se-0.07** Zr, Mo-0.60*	Free machining grade.
420	Over 0.15	1.00	1.00	12.0-14.0	.....	.....	Hardenable steel.
430	0.12*	1.00	1.00	14.0-18.0	.....	.....	Fairly good drawing.
430F	0.12*	1.25	1.00	14.0-18.0	.....	P,S, Se-0.07** Zr, Mo- 0.60*	Free machining grade.
431	0.20*	1.00	1.00	15.0-17.0	1.25- 2.5	.....	.....
440A	0.60-0.75	1.00	1.00	16.0-18.0	.....	Mo-0.75*	High hardenability.
440B	0.75-0.95	1.00	1.00	16.0-18.0	.....	Mo-0.75*	High hardenability; has best combination of 440 series.
440C	0.95-1.20	1.00	1.00	16.0-18.0	.....	Mo-0.75*	High hardenability; greatest abrasion resistance, but less toughness of 440 types.
446	0.35*	1.50	1.00	23.0-27.0	.....	N-0.25*	Good Scale Resistance.
501	Over 0.10	1.00	1.00	4.0- 6.0	.....	.....	Moderate heat resistance.
502	0.10*	1.00	1.00	4.0- 6.0	.....	.....	Moderate heat resistance.

*Maximum.
**Minimum.
Phosphorous is 0.040 and Sulfur is 0.030 unless otherwise specified.

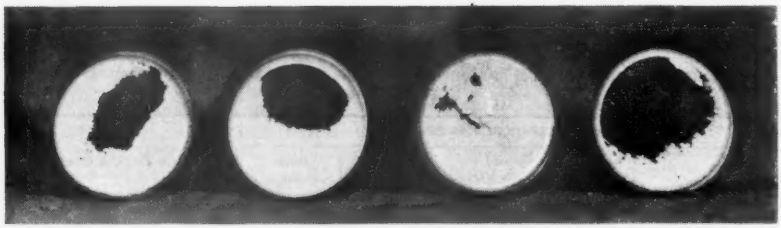


Fig. 1. An example of loss of corrosion resistance (type 302, having had intergranular carbides) due to contact with an oily contaminant.

"martensitic' stainless group does not realize its maximum corrosion resistance until after it has been hardened and stress relieved.

Annealing Procedures

Heat treatment can be defined as a series of heatings and coolings applied to a metal or alloy composition in the solid state for the purpose of changing its physical properties. Within this category, the process of annealing can be included; the purpose of this type of operation would be:

1. For the purpose of relieval of cold working stresses that have been produced in a previous working operation;
2. For the purpose of altering either the mechanical or physical properties of the alloy; or,
3. For the purpose in obtaining a definite microstructure.

The annealing of the austenitic stainless steels is of considerable importance especially in view of the variety of cold forming operations that are usually involved in the fabrication of this group. Since this group of stainless work-hardens to a considerable degree, it is often necessary to provide inter-stage anneals for the purpose of relieval of stress so that further cold working operations can be performed.

In some instances, annealing may be desirable to dissolve any intergranular chromium carbides which have been previously formed either through a hot working or welding operation. The operating temperature for annealing will vary to a slight degree; however, the range of 1850° to 2000° F. is usually accepted.

The method of quenching required should be rapid so that the dissolved carbides are kept in solution. Where distortion is no problem, water quenching is the safest practice. The non-stabilized austenitic stainless compositions containing a maximum of 0.08 percent carbon can be safely air quenched in sizes up to 0.250 inches. Air quenching is also permissible for sheets up to 0.078 inches in thickness containing as much as 0.10 percent carbon.

For greater thicknesses and higher carbon contents a water quenching is recommended. Water quenching of type 310 is always advised since this grade will precipitate grain boundary carbides even on rapid cooling. Large parts and heavy loads should be quenched as quickly as possible after removal from the furnace so they do not cool below 1650° F.[1] before immersion in the quenching bath.

The austenitic stainless steels are affected by intergranular carbides either when they are heated in the range of 800° to 1500° F., or, when material has foreign contamination such as oils or greases upon entry into the furnace. As a result, the affected areas are susceptible to rapid disintegration through intergranular corrosion when they come in contact with certain liquid corrosive media.

Thus, Figures 1 and 2 are physical manifestations of this attack by a corrosive medium; in both instances, the pickling bath employed to remove the scale after the anneal was responsible. The cause of the disintegration as indicated in Figure 1 was foreign cantamination in that the shells were packed

(Continued on page 58)

. . . Magnet Yokes, from page 51

Fig. 6. Setup in a V & O press that forms flat blanks to U-shape and also produces projections for welding a core to each yoke, as in Figure 7.

enough to slightly round edges at both ends. Then cores are rinsed, dried and inspected before going to stock. Just before assembly, the cores are tumbled for one hour in a solution containing 1.5 pt. commercial hydrochloric acid and ¼ lb. salamoniac to 3 gal. of water, are rinsed and then are dried by tumbling in Maizo. This treatment assures good contacts to promote good projection welding of cores to yokes.

Yokes and cores ready for assembly are delivered to the Thompson welding setup, Figure 7, which includes five welding fixtures like those shown close up in Figure 8. These are belted to an indexing dial and, after a pair of parts is hand-loaded, each fixture is indexed under the welding head which feeds down automatically to make the projection weld that joins one end of the core to the yoke.

In the fixture, Figure 8, the core is placed vertically in the central recess where it rests between an electrode fastened to the base and one that can rock a small amount about the vertical pivot that is a part of the screw at the left in Figure 8. The rocking electrode is actuated by a cam that pivots on the horizontal pin (rear of Figure 8). When the fixture is indexed under the welder, the cam is actuated as the head is lowered and this locks the core tightly, insuring good contact at each core side.

Before this occurs, however, and while the fixture is in loading position, an inverted yoke is set over the core, straddling the electrodes just mentioned and

(Continued on page 72)

Fig. 7. Dial setup in a Thompson welder that joins cores placed by operator's right hand in each fixture to yokes that are placed over the cores by the operator's left hand. Clamping, welding and ejection are performed automatically.

How to Figure—

Angular Setups for Machining (Continued)

Equations (18), (19), and (20) are known as *Euler's* equations. The various axes and angles as they appear when applied to the Machining problem are shown in Figure 7.

The coordinates x, y, and z of points P_1, P_2, and P_3 should be substituted into Equations (18), (19), and (20) and the resulting equations solved simultaneously for angles ϕ, θ, and ψ. However, it will, in general, be found more convenient to use the following explicit equations for these angles.

by **Prof. M. F. Spotts**
Northwestern University
Evanston, Illinois

When the body is located as in Figure 3, the coordinates of the points will be P_1 (x_1, y_1, 0), P_2 (0, y_1, z_2) and P_3 (x_3, 0, z_3). After rotation of surface $P_1P_2P_3$ into the horizontal, the z-coordinates for all three points will be equal. Substitution into equation (20) will give:

$$z = x_1 \sin\theta \sin\psi\, y_1 \sin\theta \cos\psi \quad \ldots (21)$$

$$z = y_1 \sin\theta \cos\psi + z_2 \cos\theta \quad \ldots (22)$$

$$z = x_3 \sin\theta \sin\psi + z_3 \cos\theta \quad \ldots (23)$$

After the rotation that makes P_1P_2 parallel to the ways, the y-coordinates for P_1 and P_2 will be equal. Substitution into Equation (19) will give:

$$y = x_1 (\sin\phi \cos\psi + \cos\phi \cos\theta \sin\psi) + y_1 (-\sin\phi \sin\psi + \cos\phi \cos\theta \cos\psi) \quad \ldots (24)$$

$$y = y_1 (-\sin\phi \sin\psi + \cos\phi \cos\theta \cos\psi) - z_2 \cos\phi \sin\theta \quad \ldots (25)$$

Subtract Equation (22) from Equation (21),

$$x_1 \sin\theta \sin\psi - z_2 \cos\theta = 0 \quad \ldots (26)$$

Subtract Equation (22) from Equation (23),

$$x_3 \sin\theta \sin\psi - y_1 \sin\theta \cos\psi + (z_3 - z_2) \cos\theta = 0 \quad \ldots (27)$$

Equations (26) and (27) should now be combined so as to eliminate the last terms. The following equation results:

$$[x_1(z_3 - z_2) + x_3 z_2] \sin\theta \sin\psi - y_1 z_2 \sin\theta \cos\psi = 0 \quad \ldots (28)$$

or

$$\tan\psi = \frac{y_1 z_2}{x_1(z_3 - z_2) + x_3 z_2} \quad \ldots (29)$$

Equation (26) can be rearranged as follows:

$$\tan\theta = \frac{z_2}{x_1 \sin\psi} \quad \ldots (30)$$

Equation (25) should now be subtracted from Equation (24) to give:

$$x_1 (\sin\phi \cos\psi + \cos\phi \cos\theta \sin\psi) + z_2 \cos\phi \sin\theta = 0 \quad \ldots (31)$$

or

$$\tan\phi = -\frac{x_1 \cos\theta \sin\psi + z_2 \sin\theta}{x_1 \cos\psi} \quad (32)$$

Example 3. Apply the foregoing equations to the data of **Example 1** and solve for angles ϕ, θ, and ψ.

Solution. The coordinates of the points will be: P_1(7.78, 4.32, 0), P_2(0, 4.32, 1.65), and P_3(1.97, 0, 3.36).

Substitution in Equation (29) will give:

$$\tan\psi =$$

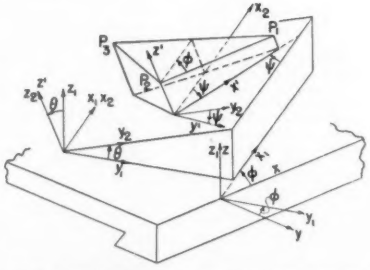


Fig 7. Coordinate Axes for Use With Euler's Equations

$$\frac{4.32 \times 1.65}{7.78(3.36 - 1.65) + 1.97 \times 1.65} = 0.430$$

$$\psi = 23.2959°$$

$$\sin \psi = 0.395$$

$$\cos \psi = 0.918$$

Substitution in Equation (30) will give:

$$\tan \theta = \frac{1.65}{7.78 \times 0.395} = 0.536$$

$$\theta = 28.2031°$$

$$\sin \theta = 0.472$$

$$\cos \theta = 0.881$$

Substitution in Equation (32) will give:

$$\tan \phi = -\frac{7.78 \times 0.881 \times 0.395 + 1.65 \times 0.472}{7.78 \times 0.918}$$

$$= -0.488$$

$$\phi = -26.0397°$$

Figure 6 from which Equations (18), (19), and (20) were derived, shows a right hand system of axes. The equations are equally applicable for left hand systems. The axes in Figure 7 are left hand and on this basis ψ and θ are positive and ϕ is negative as indicated by the results given in the equations of the foregoing example.

A slight modification of the foregoing procedure must be made if, instead of P_1P_2, line P_1P_3 is to be made parallel to the ways of the machine. Let the body of Figure 3 be rotated so that P_1 is on the x-axis; P_2 remains in the yz-plane, and P_3 remains in the zx-plane. Angle θ, as before, can be found by Equation (2). Angle ψ_1, between the hinge and side 0_10_3, can be found from the following equation:

$$\tan \psi_1 = \frac{M_1P_1}{M_1H_1} \quad \ldots\ldots\ldots\ldots\ldots (33)$$

Angle γ_1 can be found from the following equation:

$$\tan \gamma_1 = \frac{z_2}{H_1P_1} \quad \ldots\ldots\ldots\ldots\ldots (34)$$

Also from Figure 3:

$$M_1H_1 = P_1H_1 \cos \psi_1$$

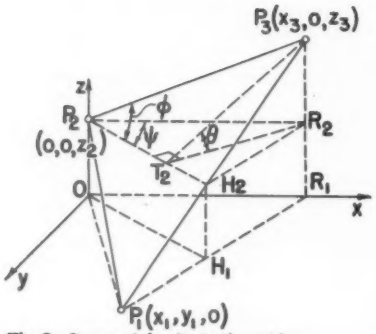


Fig 8. Geometric Relationships

$$H_2P_1 = \frac{P_1H_1}{\cos \gamma_1}$$

$$\cos \phi_1 = \frac{H_2M_2}{H_2P_1} = \frac{M_1H_1}{H_2P_1}$$

The first two of the above equations should be substituted into the third equation to give:

$$\cos \phi_1 = \cos \psi_1 \cos \gamma_1$$

Angle ϕ_1 is the angle between the hinge and the ways.

The Euler equations can be applied to the case where P_1P_3 is to be parallel to the ways of the machine. The coordinates, when the body is located as described above, will be $P_1(x_1, O, O)$ $P_2(O, y_2, z_2)$, and $P_3(x_3, O, z_3)$. The Euler equations are manipulated by exactly the same steps as previously used, and the following results will be obtained.

$$\tan \psi = \frac{y_2z_3}{x_1z_3 - z_2(x_1 - x_3)} \quad \ldots\ldots (36)$$

$$\tan \theta = \frac{z_3}{(x_1 - x_3) \sin \psi} \quad \ldots\ldots\ldots (37)$$

$$\tan \phi = -\frac{(x_1 - x_3) \sin \psi \cos \theta + z_3 \sin \theta}{(x_1 - x_3) \cos \psi} \quad \ldots\ldots (38)$$

A third possibility to be considered is the case in which line P_2P_3 is to be parallel to the ways. Figure 8 shows the body located so that P_1 is in the xy-

(Continued on page 104)

. . . Stainless Steels, from page 54

in an oily crate. In the case illustrated by Figure 2, the pieces were given a localized flame anneal at the area indicated; the temperature of which was within the harmful range previously mentioned.

When an unstabilized stainless austenitic composition contains intergranular carbides, the condition is known as "sensitization". Figure 3 illustrates this condition and the severe attack of the corroding medium on the parent metal. Close examination of this photomicrograph will indicate that complete grains have actually separated from the parent metal.

The question of intergranular carbides often occurs where either fusion welding or brazing operations are involved; the most acceptable answer to this problem is the use of either type 321 or 347 stabilized stainless compositions. These stabilized steels are annealed in the same manner as the other austenitic stainless steels; type 321 having an annealing range from 1750° to 1950° F., while type 347 has an annealing range of from 1800° to 1950° F.

They are more completely stabilized in the lower range of the recommended annealing temperatures. On the other hand, annealing in the upper portion of the temperature range gives the maximum ductility required for severe cold forming operations[1].

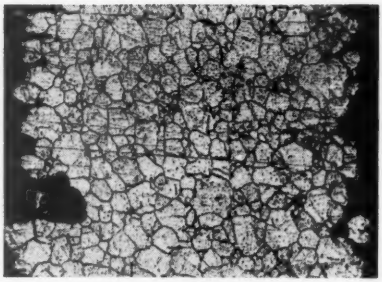


Fig. 3. This photomicrograph shows that under conditions of severe corrosion complete grains have actually separated from the parent metal.

A "stabilizing anneal" consisting of heating annealed or welded material to 1600/1650° F. for approximately 2 to 4 hours, then air cooling or water quenching is sometimes employed. This "stabilization" treatment is intended to completely precipitate all carbides as stable titanium or columbium carbides and improve corrosion resistance.

In many cases this treament is not necessary since the alloys are sufficiently

(Continued on page 80)

Fig. 2. Corrosive disintegration in areas which had been given a localized flame anneal at a temperature within the harmful range.

What you should know about Surface Broaching

. . . to gain the full benefit of its possibilities

Sketch of part showing slot broached from the solid on the CINCINNATI Hydro-Broach Machine illustrated here.

Part name	Operating shaft lever
Operation	Broach slot
Material	Steel forging
Stock removal	From solid
Production	260 per hour
Machine	CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach

Basic considerations for a good surface broaching application are rather simple, but perhaps not so well-known. They are here listed for those who are not quite sure of the application.

a) The cutter teeth must pass across the face of the surface to be machined, without interference from work or fixture.

b) To justify the initial cost of tooling, you should have sufficient production on a continuous basis; a large number of repetitive cuts like the "pine tree" slots in turbine wheels; or a sufficient quantity of similar parts to justify a minor change-over time from one part or size to the next.

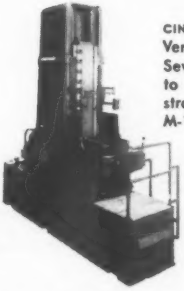
c) Other conditions being favorable, several surfaces can be broached simultaneously in one or more settings of the work.

d) The part must be strong enough to withstand the broaching thrust, or at least so designed that it can be adequately supported.

e) Depth of broaching cut should be uniform and within as narrow limits as possible.

When you've decided that surface broaching is the best process for the machining operation under consideration, then the next step is to select a CINCINNATI. Our Application Engineers are ready to help you.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach Machine. Seven sizes are available, up to 10-ton broaching force, 66" stroke. Write for catalog No. M-1389-2.

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MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CARBIDES . . .

1951 Developments for 1952 Applications

Carbide Bearings

Successful experimental use of cemented tungsten carbide bearings under high speed, high load, and temperature conditions where conventional bearings fail, was revealed at the 1951 Metallurgical Congress.

Although not as yet developed to a commercial state, progress to date indicates a strong possibility that critical bearing problems may be solved in the near future by the use of carbide metals.

In discussing the development, K. R. Beardslee, General Manager, Carboloy Department, General Electric Company, pointed out that the present trend in the design of all kinds of machinery—from machine tools to aircraft engines—is toward constantly higher speeds and higher loads.

"It is quite possible," Mr. Beardslee said, "that industry may soon reach the point where loads, speeds and operating temperatures can no longer be handled successfully by conventional bearings and bearing materials. As yet we cannot say with certainty that carbides will provide the complete answer, but we do know that bearings made of tungsten carbide meet the operating requirements of high speed, high loads and high temperatures better than any other metal we know of today.

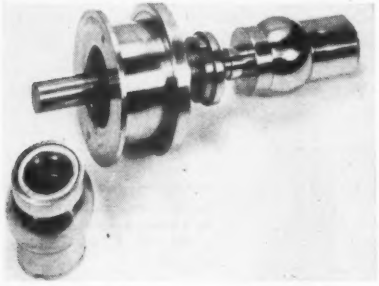


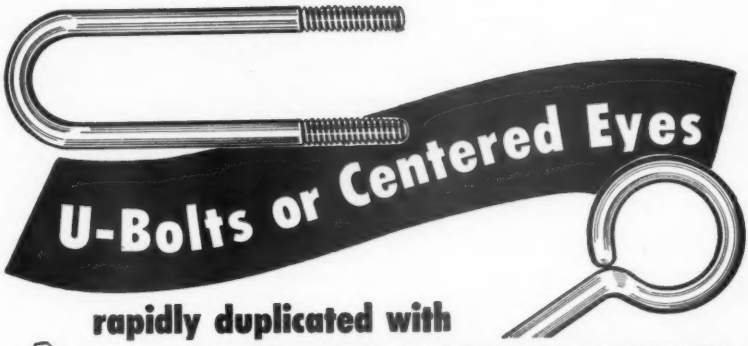
Fig. 1. Bearings of cemented carbide as used on a Brown & Sharpe grinder spindle. Use of carbide permitted such small bearing clearances that parts ground on the machine could be held to .0001" and still leave sufficient lapping stock, thus reducing lapping time by 50%. Both spindle and bearings are tungsten carbide.

"As a matter of fact," he added, "some rather remarkable results have already been obtained with experimental installations and in laboratory tests. Plain 'sleeve type' bearings consisting of carbide running against carbide have been run successfully at speeds up to 30,000 rpm and at loads up to 2000 pounds per square inch. In one typical series of tests of a ¾" diameter, ¾" long bearing, run at 10,000 rpm, the temperature rise when the load was increased from 100 to 1000 pounds per square inch was only 5° Centigrade, indicating unusual efficiency—very low power loss."

Reasons given for the successful performance of carbide bearings under extremely severe conditions include: 1. Ability of carbide metal to withstand extremely high unit pressures; 2. Ability of carbides to retain their inherent strength at high temperatures; 3. Ability of carbides to retain accuracy of fit without deformation under heavy loads; 4. The fact that carbides can be fitted with relative ease to extremely close running clearances. Such clearances remain low even under considerable increases in temperature.

Another advantage pointed out for carbide bearings is that they make possible more compact designs of machines of all kinds. Their ability to take high unit pressures means that smaller bearings can be used, theoretically, to carry the same load.

In revealing some of the development work to date on the use of carbide metals for bearings, Carboloy officials em-



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phasized that these probably will not compete with existing bearing materials and designs where the latter can operate satisfactorily. Cost of materials, it was pointed out, is inevitably higher than for conventional bearing materials.

Among successful field installations of carbide bearings where other bearing materials have given trouble, have been special high speed grinder spindles, Figure 1, operated under heavy loads; gasoline pump pivots where gasoline itself had to be used to lubricate the bearing; ways and slides of high precision, high speed machine tools; and shaft support bearings on high speed, precision balancing machines. The bearings have also been used, it is reported, in military applications at present on the classified list.

Welding Rods

The possibility of being able to "coat" metal parts with a relatively thin "skin" of ultra-hard, wear-resisting tungsten carbide was also forecast at the Metallurgical Congress.

Carboloy announced that it had completed basic laboratory development on a "weldable" tungsten carbide. It can be flowed onto metal surfaces, using conventional shielded electric arc welding equipment, Figure 2, available today in most of the larger and even many smaller metalworking plants.

Fig. 2. Producing a wear-resistant tungsten carbide surface on a draw roll with conventional shielded arc welding equipment and a carbide welding rod.

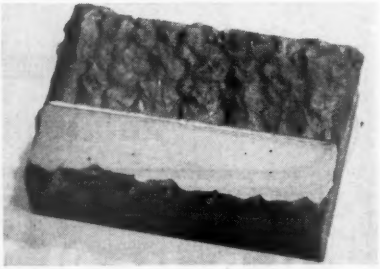


Fig. 3. The carbide surface produced by arc welding with carbide welding rods can be ground and polished if desired, as shown here.

The new product is not as yet in production as a standard item but it is characterized by Mr. Beardslee as being in the "engineering appraisal" stage and undergoing field tests. It is made in experimental production at present in conventional welding rod form and sizes ranging from $\frac{1}{16}$" to $\frac{1}{4}$" diameter.

When flowed onto a metallic surface such as steel or iron, it fuses and blends with the base metal and results in a surface coating containing approximately 70% of wear-resisting carbide.

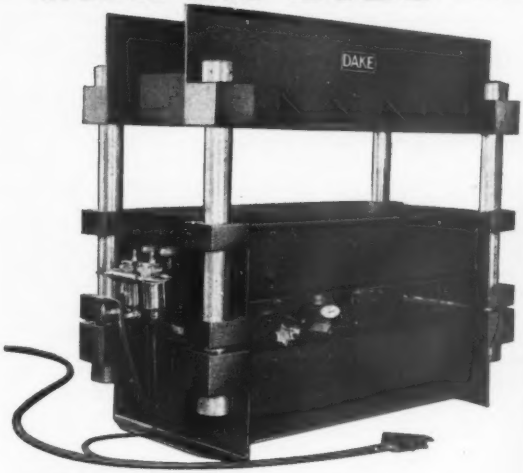
Wear tests conducted so far indicate that such a surface has a wear-resisting ability of approximately 80% that of "undiluted" tungsten carbide—and about 15 to 20 times that of the best chilled cast irons of 43 to 67 Rockwell. Data on the latter comparison were obtained using an aluminum oxide dry abrasion test.

The process of skin coating ($\frac{1}{16}$" to $\frac{1}{4}$" thick skin) appears to be most suitable where it is desired to wear-proof parts for which the use of solid carbide sections is inconvenient.

Although most suitable where high surface finish of the coating is not essential, a surface coated with tungsten carbide in this manner can be ground or polished, Figure 3, using conventional equipment as for solid carbide parts.

Several types of "binders" have been used to date in the experimental hard-surfacing-rods — including iron, nickel and cobalt. No final determination has been made as yet as to the class of application for which each type of binder is best suited.

MATCH DIES *in the toolroom*



DAKE Die Try-Out Press saves tying up production equipment

The photograph above shows a specially engineered, custom-built DAKE Die Try-Out Press of 125-ton capacity. Its guided platens assure uniform alignment in testing, enabling diemakers to match dies perfectly before they leave the toolroom.

This press was designed with an air-operated hydraulic cylinder and single-acting piston in the base. At the end of the upward stroke the release valve is opened, permitting the platen to descend by gravity.

The drawing illustrates another DAKE Die Try-Out Press—a 50-ton model with hydraulic workhead above the upper platen. The ram is powered on both up and down strokes.

Either of these presses may also be used for sample or short-run production. If you have a problem which requires development of a special press, it will pay you to communicate with DAKE.

Dake Engine Company, 634 Seventh St., Grand Haven, Mich.

DAKE arbor and hydraulic PRESSES

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Defense Comes First

Editor's note: We are pleased to present the recent address made by Richard E. LeBlond, President, The R. K. LeBlond Machine Tool Company, before the 50th Annual Meeting of the National Machine Tool Builders' Association, of which he is also President. We consider Mr. LeBlond's talk of most timely importance because it clearly defines the position of the machine tool industry in the rearmament program and because of his recommendations as to speeding up production of machine tools. Those of our readers who can act as subcontractors to the machine industry are certainly given a green light when Mr. LeBlond says, "I think every machine tool builder today should go prospecting for subcontractors."

This coming year marks the fiftieth anniversary of the founding of the National Machine Tool Builders' Association.

It was started in the Spring of 1902, when seventeen lathe builders got together at a meeting in New York at the invitation of William Lodge, then President of the Lodge & Shipley Machine Tool Company of Cincinnati. The industry's total output in that year was $23,000,000.

The meeting was described twenty-five years later by the late August Tuechter, of Cincinnati Bickford, in an article in Machinery magazine. In that article Mr. Tuechter defined the original purposes of the Association as follows:

"Good fellowship was the central thought of the plan—good fellowship and a friendly interchange of ideas. Out of this it was hoped would emerge a universal adoption of those policies or practices found to be good and beneficial to the whole industry."

I think that statement would hold just as good today as it did fifty years ago.

Now, in reviewing the last fifty years, we see that our industry has followed a rather definite pattern.

We note first of all that progress in our industry has been definitely related to the invention and development of devices designed to add to the convenience and the comfort of modern civilization.

But this relationship has been rudely interrupted three times during the last fifty years by the impact of war.

Dual Nature Poses Problems

It is the dual nature of our industry which imposes upon it the most perplexing problems which it has to face. We are essential both to the arts of peace and to the weapons of defense. Therefore, whenever a defense emergency arises, the necessity of meeting that emergency upsets completely our relationships with our normal peacetime market, with after effects which require years for their solution.

What I want most strongly to emphasize is the fact that the machine tool industry is founded upon the peacetime premise, so often repeated in this Association, of better things for more people at lower cost. That is the bedrock upon which our business is built. That is where, over the years, we earn our bread and butter. Nothing could be so conducive to the long-term prosperity of the machine tool industry as lasting world peace.

In peace, as I said before, a long-term pattern of progress is evident. There are business ups and downs of course, but in the main the story is one of new and expanded markets, as dreams in the minds of inventors finally take form and become realities.

Inventions Spurred Production

In the early days of our Association, it was the bicycle that stimulated machine tool production. Then came the automobile. It was radio that helped pull us out of the depression of 1919-1921. Mechanization of the farms gave us another big market. Large-scale production of airplanes has in recent years been a major factor. And of course beyond all these there have been developed countless devices on behalf of transportation, manufacturing, and the modern home, which have enormously broadened the base of the machine tool market.

Now we say that because people invented and developed these things, we were able to sell more machine tools. That is one way to look at it. With

(Continued on page 78)

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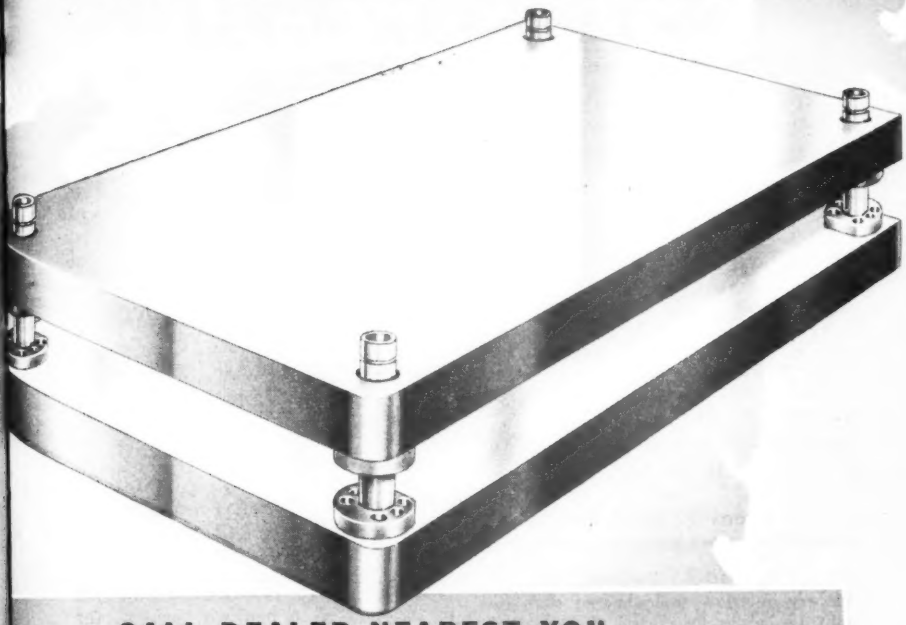

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Die Casting Die Design

Part V. (Continued)

The Finish of Overflows

Overflows need not have their cavity walls highly polished, although the side walls of their cavities should be free from undercuts so as to prevent the overflows from sticking in their individual cavities.

The Channels

The channels opening into overflows should be carefully cut. In this respect, it is best to see to it that the channel has uniform depth throughout its length and width, Figure 80-A. The channel should be free of tool marks, Figure 80-B and preferably should be polished smooth.

by H. K. Barton
and
James L. Erickson

Overflow Channels

Every overflow is connected with the main die cavity by means of a channel, Figure 73. This channel, unlike the runner leading from the sprue to the main die cavity, is similar to that portion of the feed (perviously discussed) nearest the gate; indeed, the channel is merely a passageway whose depth is seldom more than .020" in the case of zinc and .040" in the case of aluminum. Its width may, of course, vary depending upon the volume of the overflow; however, as mentioned earlier, it is best to avoid channels which are wide in proportion to the width of the area the overflow is intended to bleed, especially if this area is more than two inches. The writer has employed rather deep channels with considerable success in the production of large die castings (over 9 lbs. in aluminum). It was necessary, however, to saw these channels through in order to separate the overflows from the die casting proper as these overflows could not be sheared in a regular trimming die.

Several reasons are offered for keeping the depth of channels at a minimum; they are:

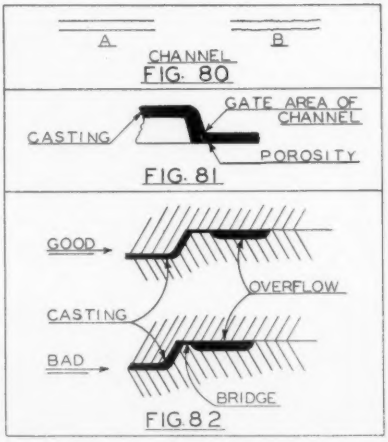
(1) When the channel becomes too deep, it is difficult to either break the overflow from the die casting proper or to shear it off in a trimming die.

(2) The deeper the channel the more pronounced is the blemish left on the surface of the die casting and consequently it is more difficult to polish out such a blemish especially where the die castings have to be polished and buffed prior to plating.

(3) When a deep channel is employed, porosity may form in the gate area of the channel which becomes exposed when the overflow is broken free of the die casting, Figure 81.

On the other hand, if the channel is too shallow it tends to choke off the free flow of molten alloy into the overflow from the die cavity thus preventing the proper filling of the overflow. This is to be guarded against particularly in cases where the overflow is employed to function as a heating element, for then the desired mass of molten alloy needed to do the heating is prevented from entering the overflow. Also, when the channel is too shallow, the entrance

(Continued on page 110)



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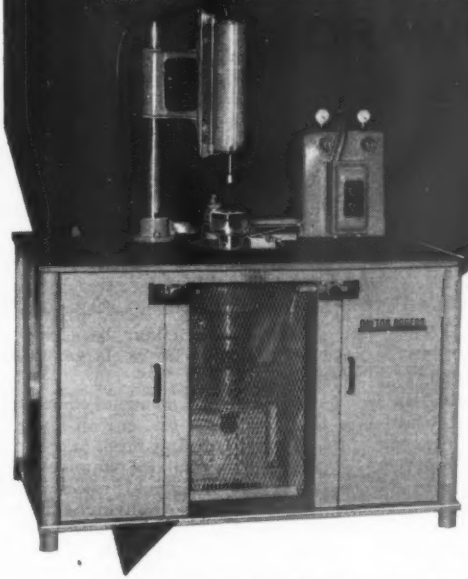

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Training Tomorrow's Foreman Today

Since no decision has been reached on which came first, the chicken or the egg, general agreement hardly is likely on whether management should first decide to start a foreman training program or to determine the subject matter covered in the program. Some management decisions, once made, set up a definite, complete course of action. Others, however, set off a form of chain reaction at each point of which further decisions must be made before the first can become really operative. This very definitely is the case when foreman training is the point at issue.

The importance of foreman training

by **R. L. Bradley**
Lester B. Knight & Associates, Inc.
Chicago, Ill.

is generally accepted by all branches of management. The value of active, sustained management interest in the ultimate benefits derived from foreman training is almost as widely recognized. However, there is less unanimity of opinion on what subjects should be covered in such training, or on who should select the subjects. Since decisions on both points materially affect the entire course of the training, as well as its end results, there are a number of influencing factors which always should be taken into account.

First in importance is arriving at the one, correct answer to the question, "What are the factory's real training needs?" The importance of determining real training needs cannot be overemphasized and no pat answer ever will suffice.

According to current dictionaries, "real" is something "existing as a fact; not imagined or made up." In practice, however, there are training "needs" which are either imagined or have been arrived at because of the bias of specialized interest.

A cost department, for example, looking at its figures only as figures, has been known to announce that plant foremen need better knowledge of cost control and their training should be directed only to that end. Personnel departments, reading their absentee and turnover reports, can be equally emphatic on the real need actually being for a program of human relations. And plant superintendents, knowing anticipated requirements, can be convinced that training in quality control and production methods represents the only real reason for foreman training.

Each of these sectors of management may well have a point—certainly they all are correct in assuming that foreman training can lead to better control of costs, absenteeism, turnover and quality, as well as to increased production—but each also well may be seeing individual problems on a larger-than-life scale.

Any one section of management should hesitate to take the responsibility for determining training needs alone. Two reasons are behind this statement. The first is that individual selection automatically assumes individual responsibility for the return which will be realized on the training investment. The second is that any empirical choice can stamp the program as one imposed from above, thus incurring the suspicion, if not actual resentment, of the men expected to participate in it.

Foreman training's most rabid supporters will not contend that it can cure all problems. Those less opinionated on the subject, on the other hand, are free to admit that it can be a tremendously effective management tool when properly applied. Therefore, it should be pointed out that foreman training, like any other management investment, will produce a return in direct ratio to the practicality of the planning which precedes it.

Practicality, of course, precludes adopting any such unrealistic approach

(Continued on page 158)

U. S. AUTOMATIC STOCK REEL

(reel at left of illustration.) AR-1 Automatic Stock Reel arranged for unwinding. Capacity: material up to 5¼ inches in width and 400 pound coils. Equipped with mercury switch control and motor. This type reel made in a range of sizes.

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U. S. Automatic Press Room Equipment—U. S. Die Sets and Access

. . . Magnet Yokes, from page 55

Fig. 8. Closeup of one of the five fixtures applied to the dial of the welder shown in Figure 7. Cam lock is at upper left and the forked ejector, pivoted at right end, is operated when its square pad is depressed. Parts before and after welding appear in foreground.

is positioned by pins so that the projections inside the yoke bear against the upper end of the core. When advanced to welding position, the electrode on the welding head is lowered against the top face of the yoke and makes the weld.

At the next indexing, the fixture is advanced to the next station where it comes to rest opposite a chute. There, the fixture clears the welder head but comes under a pin on an arm that is rocked automatically as the head is lowered to weld the piece in the next fixture. The pin strikes the square pad (right in Figure 8) on a pivoted stripper fork that is thereby rocked upward to lift the yoke weldment out of welding position. When, thus lifted, an air ejector blows the weldment into the chute and it falls into a tote box, leaving the fixture free for reloading when it returns to loading position.

With this setup, welds on 5,400 assemblies per eight-hour shift are made, yet the parts are precisely positioned and are ready for an inspection operation, Figure 9, during which the assembly is straightened by hand if it does not fit the gages in which it is inserted. These are so made that they check any twist and any core location fault.

Assemblies that pass this test go to the Cincinnati broach, Figure 10, and are hand-loaded into one or the other of two pairs of fixtures shown in Figure 11. Two assemblies are loaded in one pair and are hand-clamped while the pair previously loaded is being broached. Then the fixtures are shifted so that the pair just loaded is broached while those broached are unloaded and new assemblies can be loaded.

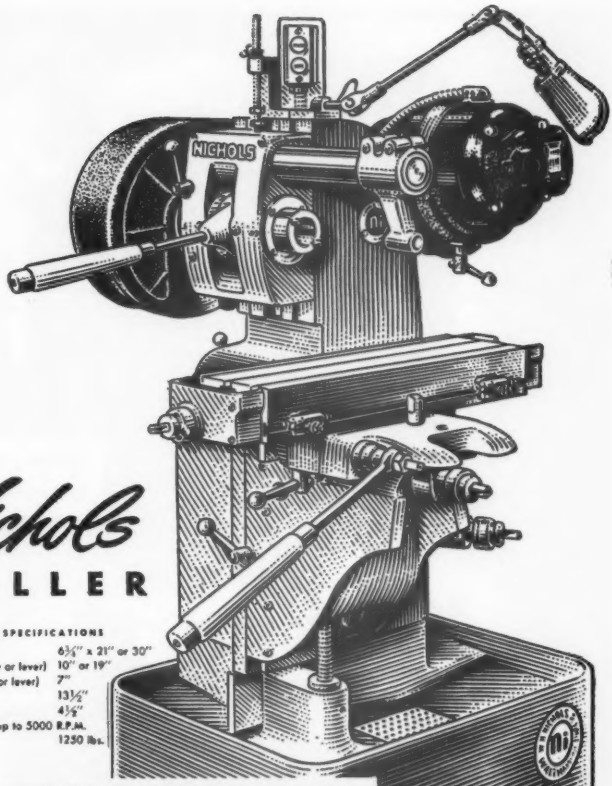
The broaches make shaving cuts along the edges of the yokes and across the outer ends of the cores; a bevel, shown in Figure 1, being cut along one edge of one leg of each yoke. All surfaces thus shaved have to be parallel within 0.002 inches over their length and the height of the three flat faces is held within ±0.001 inches of that specified.

After broaching, the parts are taken to a Magnus washer where they are given what is termed an Aja Dip and then are treated with a No. 92 Magnus solution at 185° F which produces a rust inhibiting action. Finally, a ⅛-inch Radiac disc wheel is used to remove any burrs that remain from broaching. This makes the parts ready for assembly into business machines.

One assembly that indicates the need for holding close tolerances is made in a plastic molding that includes numerous metal inserts and is shown in Figure 12. On top of the yoke, whose production

(Continued on page 76)

Fig. 9. Setup for gaging welded assemblies and for straightening them with hand tools if they are warped.



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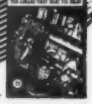

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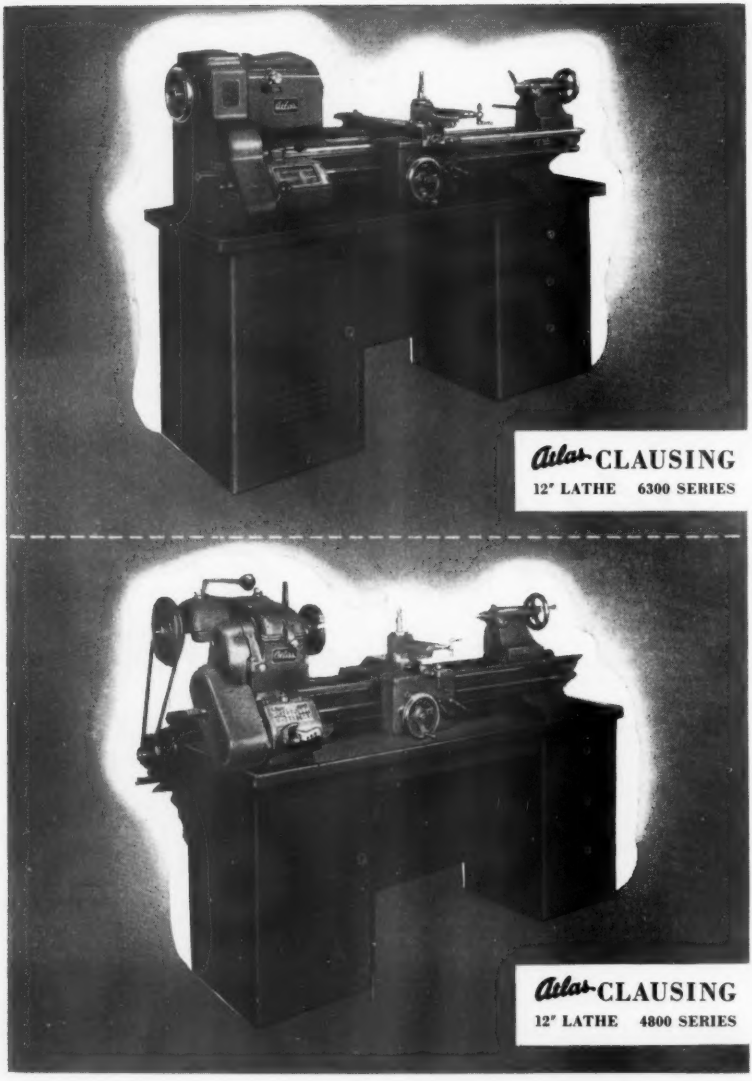
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CLAUSING—a name highly respected for years in thousands of plants—is now a division of Atlas. Atlas-Clausing will continue with the advanced features that are responsible for the Clausing lathe's excellent reputation. And the combined efforts and experience of Atlas and Clausing engineers promise even greater advancements in modern precision lathes.

6300 SERIES

★ 1" COLLET CAP., 1¾" BORE. ★ 12¾" SWING OVER BED, 7½" OVER SADDLE. ★ 24"-36"-48" BETWEEN CENTERS. ★ A.S.A. —L-00 TAPERED KEY DRIVE SPINDLE.

Outstanding construction and performance features include: Bed—heavy, thick-walled with 2 Vee-ways and 2 flat ways precision ground.

Headstock—spindle is forged steel, mounted on selected Timken tapered roller bearings, with ground, hardened nose. Gears are steel, run in bath of oil. Outboard, underneath drive, with dual V-belts. 8 speeds—50 to 1300 RPM. Variable drive (optional) provides infinite variety of speeds between 30 and 1400 RPM. Enclosed quick change gear box, with steel gears and splash lubrication, provides instant selection of 48 threads or feeds, thread range 4 to 224. Acme thread lead screw—supported in gear box by Timken tapered roller bearings.

Apron—heavy, double-walled, automatic, with splash lubrication, positive clutch, steel and cast iron gears.

4800 SERIES

★ ½" COLLET CAPACITY, 25 32" BORE. ★ 12¾" SWING OVER BED, 7½" OVER SADDLE. ★ 24"-36"-48" BETWEEN CENTERS. ★ 1½"-8 THREADED SPINDLE.

Outstanding construction and performance features include: Bed—heavy, thick-walled with 2 Vee-ways and 2 flat ways precision ground.

Headstock—spindle is ground alloy steel, mounted on selected Timken tapered roller bearings. Countershaft has friction clutch and brake for stopping spindle without stopping motor. Countershaft spindle turns on ball bearings. V-belt drive. 12 speeds—43 to 2270 RPM. Quick-change gears, 48 thread selections, 4 to 224. Gear box shafts are ground steel, turn on ball bearings. Gears are ½" wide steel. ⅜" lead screw with Acme thread.

Apron—heavy, double-walled, automatic with splash lubrication, positive clutch, steel and cast iron gears.

Catalogs sent on request.

Atlas CLAUSING PRECISION MACHINE TOOLS

ATLAS PRESS COMPANY
1284 NO. PITCHER STREET
KALAMAZOO, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Magnet Yokes, from page 72

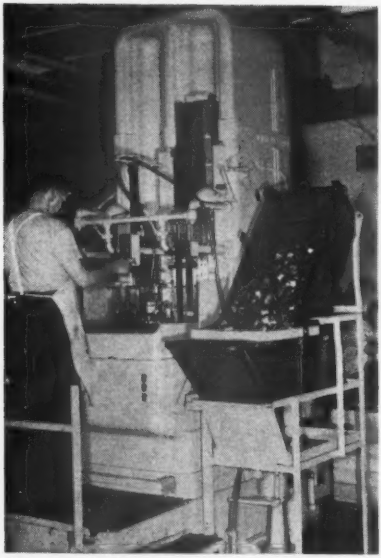


Fig. 10. Cincinnati broach employed to make shaving cuts along the edges of yokes and outer ends of cores welded to the yokes.

has been described, is an armature plate that pivots on one machined edge of the yoke when the armature is attracted by energizing the coil applied over the core.

Twelve small leaf springs anchored in the plastic extend above the armature, which is a flat steel plate, and through holes in a tiny plastic molding fastened

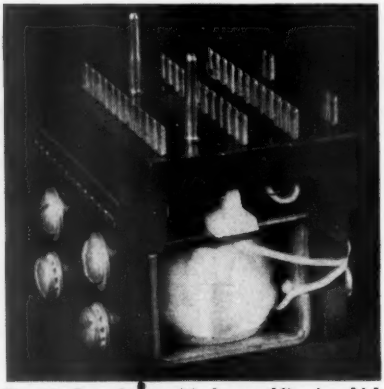


Fig. 12. One of the critical assemblies in which yokes, produced as described in the text, are placed. The armature operates tiny leaf springs that contact slots in the J-shaped inserts of the plastic molding.

on top of the armature. Each leaf spring has its free end in a slot cut in a J-shaped brass insert. When the armature moves, it must make or break the contact between each spring and the side walls of the slot.

If the yoke is warped or the critical dimensions are not within the close limits specified, the contacts that the leaf springs make in their respective slots will not occur as specified. Clearly, it is of great importance that precision in yoke production be maintained if correct and dependable functioning, that is so important in business machines, is to be attained.

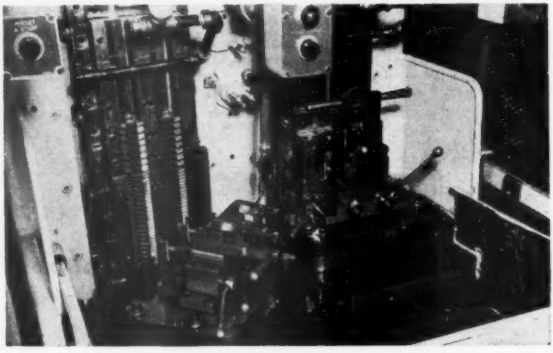
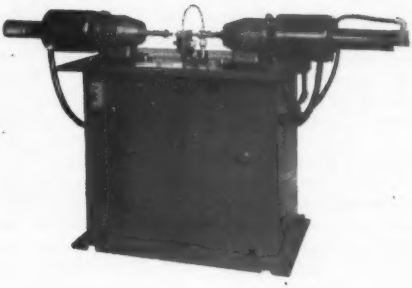


Fig. 11. Closeup of the broaching fixtures, of which there are two pairs, one being loaded while workpieces in the other pair have edges and core-ends shaved.



A New Machine for Opposed Sequence Operations

Here is a new machine that not only simplifies drilling, counterboring and reaming, opposed operations in sequence, but also greatly improves the quality of finished parts.

It incorporates 2 Model HH Govro-Nelson Units, wired to operate automatically in sequence.

The operator loads the small steel part in the fixture and touches the start button, whereupon one Unit drills a No. 44 hole and a No. 30 counterbore with a combination tool.

When this operation is completed, the second Unit comes in from the opposite side and reams part way a No. 38 hole .004" off the center line of the first drilling and counterboring operation.

If you have tapping or countersinking operations and would like to speed up your production rate, send samples and part prints and we shall be pleased to recommend the proper Automatic Units or quote on a complete set-up. Literature sent upon request.

WRITE FOR *Literature*

GOVRO-NELSON CO.

Machinists of Precision Parts for 28 Years

1933 ANTOINETTE
DETROIT 8, MICHIGAN

Automatic **DRILLING UNIT**

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Defense, from page 64

equal truth it can be said that because we invented and developed better machine tools, machines that could do things never done before, it became possible to manufacture these devices at a cost low enough to permit the public to buy them.

I think you will find that a graph of technical improvements in machine tools will serve equally as well as a graph of the progress of modern industrial civilization.

This, gentlemen, is our normal and proper function—the function which war, or the threat of war, interrupts. When that happens, we must suddenly change our sights, view the picture from an entirely different perspective, and plunge feverishly into all-out production for defense.

Here, too, as I said before, a pattern has emerged out of our experience of the last fifty years. It is a pattern which is inherent in the nature of the circumstances. It was basically the same in World War I and in World War II as it has been thus far in our present defense program.

Post-War I Report

Let us go back for a moment to World War I. Following this war, the War Industries Board prepared a report of the part played by American industry in the war, compiled under the direction of Bernard Baruch. It is interesting to note, in the chapter on machine tools, this sentence:

"At first the industry was not placed on the preference list for fuel, labor and transportation; but it was soon found expedient to give the industry an automatic rating of A-6."

It is also interesting that a machine tool section of the War Industries Board was not formed until October 1, 1917, when, as the report states, "It was clear that an important shortage of larger machine tools was likely to be felt if the war should continue."

There is also mentioned in this report the difficulties of determining what machine tools were to be built, and in what quantities.

I might add, in passing, that Mr. Baruch's report states categorically, "Cincinnati is the greatest machine tool manufacturing center in the world." I hope you won't blame me for liking that sentence.

But to get back to the point—the peak of machine tool production in World War I, in 1917, totaled only $220 million. But the same familiar obstacles—difficulties with priorities and inability to determine requirements in advance—had to be overcome to achieve even that total. I think we simply have to accept these things as part of the defense production pattern.

A war or defense program springs into being overnight. We find ourselves suddenly dealing with people we have never seen before, and people who do not understand the nature and the functions of machine tools. It apparently takes a certain inevitable length of time before these people comprehend the machine tool function, and in particular the time factor in connection with the production of machine tools.

Furthermore, the exact purposes of machines ordered, or the quantities in which they will be needed, cannot, in many cases, be definitely ascertained. Programs and specifications change too rapidly. Many facts are not revealed, for obvious defense reasons. We cannot expect matters to proceed as they would if we were dealing with our peacetime customers. It simply isn't in the cards.

The first phase of the defense program cycle, therefore, is inevitably one of difficulty in getting priorities, confusion as to requirements, and delays. In World War II, this phase of the cycle was completed, in part at least, during the National Defense Program which preceded the war, and, as you recall, we were therefore able to get priorities very early in World War II. This time, we spent a whole year after fighting broke out in Korea in completing that cycle.

The next phase of the cycle is of course that of priorities, assistance by Government, and all-out production. That is the phase of the cycle we are in today; and I will discuss that more in detail later in this talk.

But now let's go on to the third phase of the cycle, which happens after the emergency is over.

There were postwar surpluses that

(Continued on page 86)

Why wait? Perhaps the Job Can be Done on a Standard Machine with Kempsmith Attachments

You know — it's really surprising how many difficult milling operations can easily be handled by Kempsmith Standard Attachments mounted on a standard milling machine.

Manufacturers faced with urgent production schedules are utilizing Kempsmith Standard Attachments to help solve their milling problems. These precision-built accessories are made to perform the most delicate milling operations, with speed and accuracy. They frequently eliminate the need for special, single-purpose machines, at the same time reducing production costs to rock bottom.

Look to Kempsmith for milling machines, attachments, arbors and accessories. They are backed by more than 60 years specialized experience in this field.

Write for bulletins describing Kempsmith Standard Attachments, Arbors and Accessories.

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KEMPSMITH

Precision Built Milling Machines Since 1888

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. . . Stainless Steels, from page 58

stabilized by annealing. However, where stabilized grades are to be exposed to rigorous corrosive attack in the service range of 800° to 1650° F., they should be given a stabilizing anneal as the final operation[3].

Regardless of the type of stainless steel to be annealed, the prime requisites are (1) that the work entering the furnace be clean, (2) that sufficient time be allotted so as to realize complete homogenization, and (3) that a rapid quench be utilized so as to prevent reprecipitation of the carbides.

The ferritic stainless compositions should present no problems in annealing since these compositions have no air hardening tendencies and, consequently, can be quenched either in air or water after annealing has been completed. Usually, light sections are air cooled so as to prevent distortion; heavy sections may be either air or water cooled. As a general rule, cooling these alloys rapidly from the annealing temperatures results in improved impact properties[3]. Also, retarded cooling to the 750° to 1050° F. range should be definitely avoided as it induces brittleness.

Although the normal annealing temperature employed is usually under 1550° F., one should realize that the ferritic stainless compositions tend to develop a coarse grained structure and become embrittled; this coarsening becoming quite evident when held for prolonged periods of time above 1650° F.

Controlled cooling is necessary in the annealing of the martensitic stainless steels due to their propensity for air hardening. However, where a process anneal is employed, the manner of cooling is inconsequential since the temperature chosen is below the critical.

It is of interest to note that both types 414 and 431 which, in addition to the chromium, have a nickel content of from 1.25 to 2.5 are not usually full annealed. This is probably true since considerable more austenite is formed at the elevated annealing temperature along with the fact that the speed of transformation is also decreased. Thus, a full anneal followed by the conventional slow cooling will result in a hardness value considerably more than that experienced with the other martensitic grades.

The best range of temperature to be employed in annealing both the ferritic and martensitic steels is tabulated; the time at temperature depending upon the size of the load. The cooling rate for the martensitic stainless steels is usually given at from 25° to 50° per hour; the slower rates giving slightly lower hardnesses. Slow cooling is usually stopped at 1100° to 1200° F. and the material withdrawn from the furnace and cooled as rapidly as desired.

For any of the hardenable grades, unless maximum softness and ductility are required for severe cold forming, it is not necessary to resort to a full annealing treatment. Usually sufficient ductility can be secured by a process anneal carried out just under the critical temperature.

(To be Continued)

References

1. "Heat Treating and Pickling of Armco Stainless Steels," Armco Steel Corporation, Middletown, Ohio, 1949 ed.
2. "New Precipitation Hardening Stainless Steels," G. N. Goller and W. C. Clarke Jr., Iron Age, March 2, and 9, 1950.
3. "Heat Treating Stainless Steels," L. F. Spencer, Iron Age, May 11 and 18, 1950.
4. "Nitriding Stainless Steels for Better Wear Resistance," S. Low, Steel, Aug. 6, 1951.
5. "Heat Treatment and Physical Properties of the Austenitic Chromium-Nickel Stainless Steels," 1947 ed., The International Nickel Co., Inc., Development and Research Division, New York City.
6. "The Stainless Steels—Hardening and Annealing of the Low, Medium and High Carbon Steels," L. F. Spencer, Steel Processing, Jan. and Feb. 1948.
7. "Stainless Steels—Their Selection and Application," T. C. Du Mond, Materials & Methods, May 1950.
8. "Process for Surface Hardening Stainless Steels," Bulletin 21, The Drever Co., Philadelphia, Pa.
9. "Surface Hardening of Stainless Steel Parts," Stainless Surface Hardening Co., Cambridge, Mass.
10. "Handbook on Stainless Steels," Allegheny Ludlum Steel Corp., Brackenridge, Pa.
11. "A Precipitation Hardening Stainless Steel of the 18 percent Chromium, 8 percent Nickel Type," R. Smith, E. H. Wyche and W. W. Gore, Amer. Inst. Mining and Met. Eng., Tech. Pub. 2000G, Metals Technology, June 1946.
12. "Eastern Stainless Steel Sheets," Eastern Stainless Steel Corp., Baltimore, Md.

Next month, Mr. Spencer will describe the hardening procedures for the several stainless steels. These will include the time factors to be employed when preheating prior to actual hardening; followed by the various surface hardening methods employed to increase wear resistance and decrease the tendency to size and gall.

2 New Toolroom Aces

Jig Borer of the Carbide Era—For boring drilling, reaming and spotting holes in dies, jigs and production parts, the speed and accuracy of the Moore Jig Borer cannot be equaled. More than 1,100 users of the No. 1 model will verify that. Now with this larger No. 2 model specially engineered for the Carbide Era, holes from .0135" (or smaller) up to 7" can be accurately located and produced in a fraction of the time required by other means. Hardened, ground and lapped lead screws, permitting table settings within .0001" by coordinate location, eliminate the need for end measures—reduce set-up time! Sensitive, centralized controls for spindle speeds and feeds, quick tool-changing and easy lubrication add up to more time and effort saved —more accurate work produced.

Jig Grinder of the Fifties—The originators of the Jig Grinder have done it again! With this completely new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. The same quickly set precision lead screws, as in the Moore Jig Borer, simplify the finish-grinding process. Holes from $\frac{1}{64}$" to 8" can be relocated and ground within .0001"—by power or hand feed. The infinitely variable spindle speeds, up and down feeds, and special stops and scales built into the machine, permit fast, accurate grinding of contours. Complete punches and dies can be ground to figures, with no stoning or fitting required for perfect alignment of mating parts.

In the Toolroom and on the Production Line, the Moore Jig Borer and Jig Grinder team up for speed and accuracy. Write for descriptive literature on both machines today. Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Connecticut.

HAVE YOU BOUGHT YOUR COPY OF **PRECISION HOLE LOCATION?** More than 7,000 copies of this valuable book on jig-boring and jig-grinding practices have been sold to date. Available at special price of $3 in U.S.A., $3.50 outside U.S.A. 448 pages, over 400 illustrations, 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Company, Inc., Bridgeport 7, Connecticut.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS
MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

FORESIGHTED

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Constant-speed drive shaft insures uniformly rapid automatic movements. Change gears provide production rates from 3 to 364 seconds for one piece per cycle. 16 spindle speeds from 10,000 to 910 r.p.m. Takes stock to ¼" dia. and turns up to 2⅞" length.

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Skilled-Operator Shortage...

Tool Adjusting Dial Indicator on swing-arm affords quick, accurate replacement of tool . . . saves time and cut-and-try spoilage.

Individual Micrometer Stops for each tool simplify accurate duplication of parts without machining cams to extremely close accuracy.

Brown & Sharpe Automatic Pinion Turning Machine

equips you for high output, without expert pinion turning specialists!

With defense orders now adding to normal demands for staff and pinion work, the Brown & Sharpe Automatic Pinion Turning Machine represents one of the soundest investments many manufacturers can make.

This modern automatic single-point turning machine dependably meets all close-tolerances and fine-finish requirements of military and civilian assemblies such as clocks, instruments, fuses and timers. What's more, accurate operation with exceptionally high uniformity can be maintained without highly skilled operators.

Write for detailed specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Simultaneous Multiple Drilling

An excellent example of the flexibility possible in designing machines to bring drilling and tapping tools to the work in angular and inverted positions for simultaneous machining in a single handling of a part or assembly is illustrated in this triple drilling unit.

The setup was devised by Boice-Crane Company, of Toledo, to speed up production of its welded all-steel jointers for woodworking and illustrates the flexibility of modern, intermediate capacity drill presses.

Three universal 5-speed heads are shown ready for the application of automatic and semi-automatic pneumatic feeding devices. Standardization has resulted in unit prices that cut usual custom-built special purpose machine costs by as much as 500%.

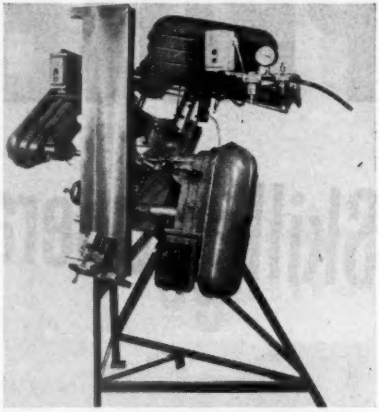
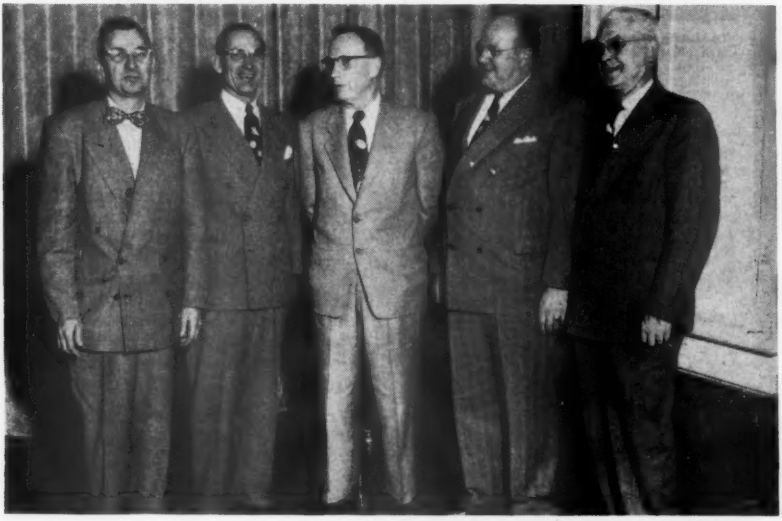


Photo courtesy Boice-Crane Company

★ ★ ★ ★ ★

Pictured below are the new officers elected at the recent annual meeting of the National Tool and Die Manufacturers Association. They are, left to right: Herbert Harig, vice-president, Harig Mfg. Corp., Treasurer; Herbert C. Murrer, president, Murrer Tool Co., Second Vice-President; Randolph H. Cope, vice-president, Bunell Machine & Tool Co., President; Alfred Reinke, president, Gus Reinke Machinery and Tool Co., First Vice-President; and Joseph N. Huser, president, B & H Specialty Co., Secretary.



DRESS COMPLEX FORMS *in one continuous motion*

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Dresses Two Angles Tangent to Radius in One Continuous Motion!

Adaptable to All Types of Cylindrical and Surface Grinders

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J & S Elevator Diamond Extension

J & S Adjustable Angle Ramp

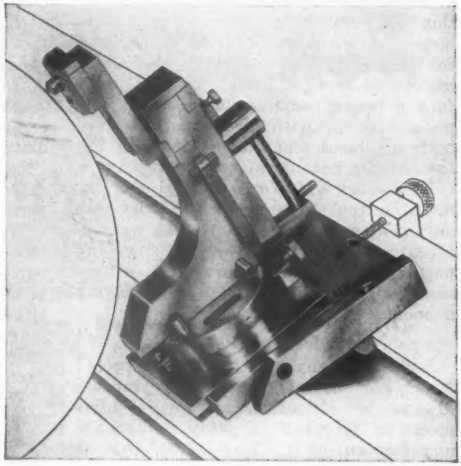


Photo shows how the standard J & S Model "E" Dresser is applied to cylindrical grinder with inclined table, wheel over 14" dia. Two standard J & S attachments (shown above) easily adapt dressers to all grinders.

You can increase production rates of your grinding machines by reducing time-off for form-dressing. For fastest possible dressing, J & S "Fluidmotion" Dressers are the answer. With "Fluidmotion," only *one setting* is necessary for dressing two angles tangent to a radius—using ONE handle in *one continuous motion.*

Resulting forms are clean, precise—angles and radii flow into each other. On high production set-ups, sharp contours without tool or chatter marks are consistent to .0001" accuracy.

With today's tight supply of experienced machinists—and ever-increasing demand for faster production—it will pay you to investigate J & S "Fluidmotion" Dressers. They are the *simplest, fastest dressers* you can buy—*even beginners can use them* to boost production rates of your cylindrical and surface grinders. Write for DRESSER CATALOG.

J & S "Fluidmotion" Dressers are one of the popular J & S "Machine Shop TIME SAVERS." ("Time Saver" booklet, describing J & S "Fluidmotion" Wheel Dressers, etc., sent on request.)

J & S TOOL CO. INC.

475 MAIN STREET EAST ORANGE, NEW JERSEY

Representatives In Principal Cities

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Defense, from page 78

had to be contended with after World War I, but they did not present such a serious problem because war production had not been proportionately so large. After World War II, in addition to large surpluses, we bore the added burden of renegotiation. This time, we face a tough combination of taxes and price control, with the expectation of both surpluses and renegotiation to follow. It is not an attractive picture.

How much did World War II cost the machine tool industry? That we can only conjecture. We know that we suffered a subnormal market for five long postwar years, and underwent a depression while other industries were having a boom.

No Solution in Sight

Isn't there any way out of this cycle? Must our normal peacetime progress always be dislocated by the requirements of defense? Frankly, I can't see any way out of it. I am afraid that as long as there is likelihood of wars, this is the cycle which we are going to have to face. It is a problem that is particular to the machine tool industry, but we have learned to live with it. There are plenty of companies represented in this room which have survived three complete turns of the cycle. We have done it before, and we will do it again.

But that does not mean that we should not make every effort to minimize the extremity of the swings of the cycle. And I think past experience points to something which we can do in this respect.

When a defense program suddenly starts, our initial difficulties arise largely because the men with whom we deal do not understand the function and nature of machine tools.

But after we had redesigned our machines and displayed them at the 1947 Machine Tool Show, we ran into trouble because **financial** men—the men who control the purse strings of customer companies—did not properly understand the nature and function of machine tools.

Our difficulty in both cases arose largely from the same cause.

I think, therefore, that it is up to our industry to maintain a continuous effort to educate more people as to what machine tools are and what they do. The more we can accomplish in this direction, the less will be our difficulties at the start of a defense program, and the less will be the sales resistance we encounter when we introduce new models after the program is over.

Now let's turn from past history, and conjecture as to the future, to the immediate situation.

In my opinion there is no question but that our United States is today in desperate danger.

We know that international tension is mounting in many quarters, and apparently will continue to mount regardless of the immediate outcome of the Korean situation. Sooner or later this tension must somehow be resolved. It would only take an incident to set off the powder keg.

We all hope there will be some other way out. We all hope and pray for peace. But our hope for achieving peace may depend chiefly upon how fast we prepare for war.

Now, every item of military use, including the atomic bomb itself, requires machine tools for its manufacture. I think that today a nation's military potential can best be weighed literally in terms of its metal-cutting capacity.

Western European Plants Might Be Lost to Enemy

We must remember that in the event of war, machine tool plants in West Germany, England, France and Italy might conceivably be knocked out practically overnight. Or they might be captured and put to use by the enemy.

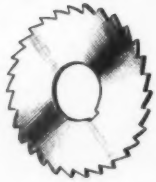
If war should break out, therefore—and remember that is the possibility against which we are preparing ourselves—not only would the immediate need for machine tools be vastly multiplied overnight, but it is highly probable that the entire load might descend upon the machine tool industry of the United States. There is no need to emphasize to you the predicament we could be in if that should happen tomorrow.

Gentlemen, we are far behind where we should be in our production effort—very far behind. You know the reasons

(Continued on page 140)

Victor's Specials Deserve Your Attention!

METAL SLITTING SAWS



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Diameter	Thickness	Hole	Price
2½"	1/32"	7/8"	$2.52
2½"	3/64"	7/8"	2.52
2½"	1/16"	7/8"	2.52
2½"	3/32"	7/8"	2.52
2½"	1/8"	7/8"	2.61

Diameter	Thickness	Hole	Price
3"	1/32"	1"	$2.97
3"	3/64"	1"	2.97
3"	1/16"	1"	3.06
3"	5/64"	1"	3.40
3"	3/32"	1"	3.06
3"	7/64"	1"	3.50
3"	1/8"	1"	3.15
3"	5/32"	1"	3.70
3"	3/16"	1"	3.80

Diameter	Thickness	Hole	Price
3½"	1/32"	1"	$3.87
3½"	3/64"	1"	3.96
3½"	1/16"	1"	4.05
3½"	5/64"	1"	4.23
3½"	3/32"	1"	4.23
3½"	7/64"	1"	4.50
3½"	1/8"	1"	4.50
3½"	5/32"	1"	4.68
3½"	3/16"	1"	4.95

Diameter	Thickness	Hole	Price
4"	1/32"	1"	$3.87
4"	3/64"	1"	3.96
4"	1/16"	1"	4.05
4"	5/64"	1"	4.70
4"	3/32"	1"	4.23
4"	7/64"	1"	5.00
4"	1/8"	1"	4.50
4"	5/32"	1"	4.68
4"	3/16"	1"	4.95

Diameter	Thickness	Hole	Price
5"	1/16"	1"	$5.22
5"	3/32"	1"	5.67
5"	1/8"	1"	5.94
5"	5/32"	1"	6.30
5"	3/16"	1"	6.66

TOOL OF THE MONTH

Diamond Point Emery Wheel Dressers

¼ Kt. for use on 6" Dia. Wheels $2.85 ea.
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¾ Kt. for use on 10" Dia. Wheels 6.90 ea.
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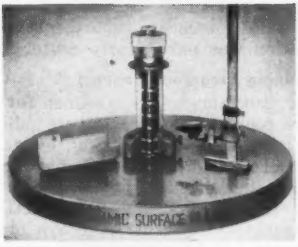

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Annual Meeting Report: N.T.D.M.A.

OFFICERS FOR 1952

St. Louis, November 2 . . . Randolph H. Cope, vice-president and manager of The Bunell Machine & Tool Co., Cleveland, was elected president of the National Tool and Die Manufacturers Association at the annual convention here today. The association represents 500 of the nation's leading contract tool, die and special machinery shops. Other officers elected are: Alfred Reinke, president of Gus Reinke Machinery & Tool Co., Hillside, N. J., First Vice-President; Herbert C. Murrer, president of Murrer Tool Co., Cincinnati, Second Vice-President; Herbert Harig, vice-president and treasurer of Harig Manufacturing Corp., Chicago, Treasurer; and Joseph N. Huser, president of B & H Specialty Co., Indianapolis, Secretary.

Tooling centers throughout the country are facing an acute shortage of skilled labor, with more than 5000 skilled workers badly needed by contract shops alone, it was reported at the November annual meeting of the National Tool and Die Manufacturers Association. George S. Eaton, Executive Secretary of the Association, told the 250 executives attending the sessions that this labor shortage is occurring at a time when the industry is facing the biggest backlog of orders in its history. Most of this backlog—as much as 90% in some tooling areas—is for armament tooling from aircraft, electronic and ordnance manufacturers who need vital dies, fixtures and gages, before actual manufacture can begin.

Various Areas Report

According to a current business and labor conditions survey, practically every tool and die shop has needs for more manpower. For example, in the Chicago tooling area, there is room for 1000 additional skilled workers. In Rochester, N. Y., the contract shops are actively seeking 300 to 350 more men, with little prospect of finding them, even though defense work makes up 90% of tooling activity. According to Randolph H. Cope, newly elected president of NTDMA, and vice-president of The Bunell Machine & Tool Co., Cleveland, the Cleveland tooling area can use up to 300 more men. Defense business in that area is increasing steadily. Indianapolis reports showed a need for 250 men; Dayton, 300; with St. Louis needing "several hundred" and the Western Massachusetts tooling area seeking "hundreds."

According to executives attending the conference, these figures become even more significant when it is considered that there are no more than 45,000 men in the entire country who qualify for work in the tool and die field. All of these are now employed, hence there is no "pool" available. As a result, labor pirating continues in many tooling centers. New manufacturing plants starting up in a number of areas make the situation even more critical. Southern Connecticut NTDMA trustees reported that their situation was particularly acute.

Training Programs Proposed

Training programs to prepare men for the precise tool and die work were advanced as one means of building, eventually, a pool of talent for the industry. A special panel headed by DeForest Pratt, Director of Training, Cincinnati Milling Machine Co., discussed ways of increasing the efficiency of such programs. Colonel Lewis F. Kosch, Chief of the Manpower Division, Selective Service System, outlined the relationship between the Armed Services and training programs. The tool and die industry has requested Selective Service to view such training in the same light as the Service views college training. NTDMA executives pointed out that it takes from four to seven years to train men for their type of work. Interruption of training is uneconomic, they contend, slows down the vital "tooling up" process required in defense industries.

"Wage stabilization regulations inevitably tend to become the minimum level

(Continued on page 95)

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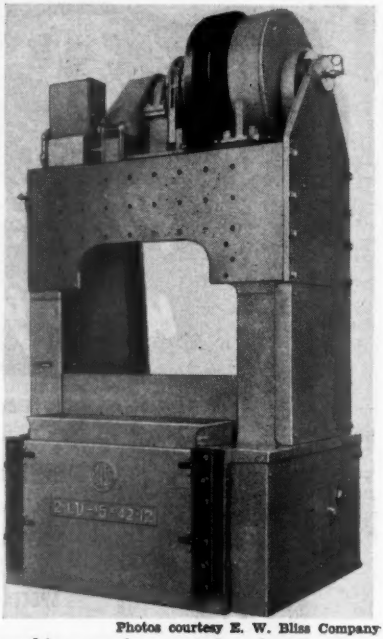
New Gap-Type Welding Press For Spot Welding Assemblies

Development of a gap-frame welding press, in cooperation with a major automotive manufacturer, for use with welding fixtures in the mass production of spot welding assemblies has been recently announced. The gap style frame permits conveyorized feeding from side to side. This construction facilitates easy access to the work by operators and makes the work accessible from either front or back of the press.

The slide is located in the lower portion of the press and the work stroke is upward. Parts to be welded are laid on the lower "die," which contains welding tips. As the work moves up, it comes in contact with the fixed welding tips attached to the upper part of the press. The slide dwells in the upper position, holding the parts in contact with the electrodes until welding is completed.

The pneumatic friction clutch, flywheel and motor are located at the top of the press for the purpose of cleanliness and accessibility. The driveshaft is connected by a long eccentric rod to the slide actuating mechanism located in the lower part of the press. This mechanism is enclosed against dirt and damage.

The work stroke is adjustable and the shut height is the same for all adjustments. Operating cycle is divided into thirds—120° for upstroke, 120° dwell, 120° downstroke. Each portion of the cycle takes a fraction of a second. The machine can be started and stopped at any point in the cycle under load.



Photos courtesy E. W. Bliss Company

Slide widths on present models range from 42" to 84" with 12" depth on all widths.

★ ★ ★ ★ ★ ★

New Full-Color Movie on Steel Casting

"Steel with a Thousand Qualities," thought to be the first full-length, full-color industrial motion picture covering virtually all phases of modern steel foundry operations and techniques for the production of carbon steel, special alloy and stainless steel castings, has just been completed.

Intended to serve a primary public service function as a steel casting educational and informational aid, the 16-mm sound film runs 37 minutes and is being made available free of charge for showing by and to industrial groups, engineering societies and colleges.

As its title implies, the film puts recurrent, convincing emphasis on the foundry's insistence on achieving casting quality as the end objective of all operations, from the initial blueprint stage to final delivery to the user. It covers almost every aspect of advanced steel foundry process and practice, while utilizing a semi-technical approach keyed to understanding by an intelligent lay audience as well as technical groups.

Superior builds "Tailor-Made" die sets of any size . . . for any purpose. This large 3-pin flat gang bolster (128" long, 21" deep), recently built and machined complete for one of the nation's leading manufacturers.

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In addition, Superior All-Steel Die Sets incorporate many features found on no other set . . . features such as the *Safety Flange* and *Lock Jaw Lifting Device* which permit movement of any type, in any direction with a maximum of ease, speed and safety.

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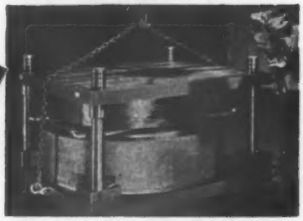
FREE CATALOG available to those interested in securing a detailed description of Superior All-Steel Die Sets. It's information you won't want to miss. Write and ask for your copy of Catalog No. 111, Today.

Exclusive Superior "Lock-Jaw" with locking key inserts in slots of Safety Flange . . . ready for any type movement or manipulation.

Exclusive Superior Safety and Lifting Device assures safer and speedier handling of die sets of any size.



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2754 South 19th St., Milwaukee 7, Wisconsin

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

More Defense Contracts Sought for Small Business

An intensive program of actions to be taken by the 105 field offices of the Department of Commerce in aiding small manufacturers obtain defense contracts has been initiated by the NPA Office of Small Business.

The program was set forth in two directives, which emphasized that the new instructions were intended to supplement current activities in behalf of small business by various State bodies, the military services and Federal civilian procurement offices.

The directive on subcontract placement calls for field offices to perform the following functions: (1) locate small plants with adequate facilities and the ability to perform; and otherwise determine available open productive capacity for subcontract work; (2) contact, at the management level, concerns which have obtained prime contracts; determine their needs for outside facilities, and encourage subcontracting with small factories; (3) advise manufacturers of facilities available for subcontracting; (4) maintain a current inventory of small plant facilities.

The second NPA directive to its field offices instructs them to: (1) develop and disseminate information for small businesses with respect to Government procurement; (2) provide for the assembly and effective use of facilities records by Government procurement offices; (3) assist Government procurement offices by locating specific outside production capacity needed by them; (4) provide for handling, or forwarding to the appropriate authority, the request for a small firm for an impartial hearing with respect to a Government procurement action in which the firm believes it is being discriminated against; (5) maintain contacts with Government procurement personnel to insure proper implementation of Government pro-

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curement policies with respect to small firms; (6) maintain liaison with other sources of information on Government procurement; and (7) provide information and counsel to small firms interested in forming production pools; and represent the Government in authorized organization meetings of such groups.

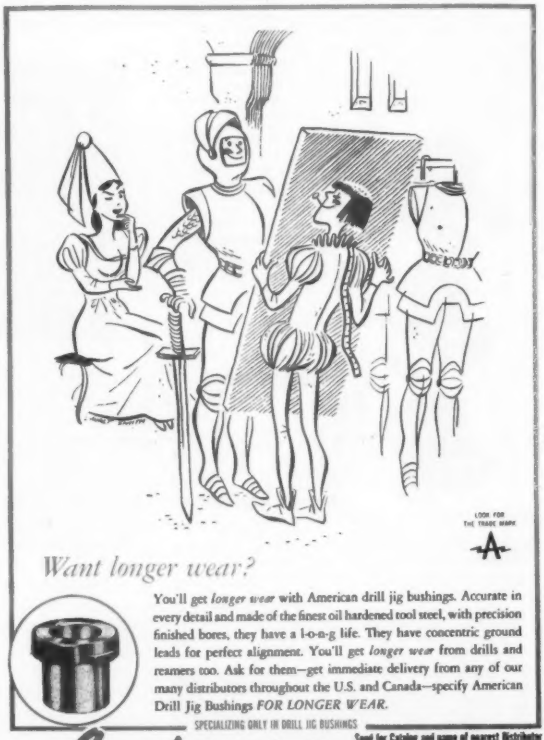
Representatives from the National Authority's Office of Small Business in Washington will visit the field offices to assist in implementing the new directives and to insure the effectiveness of the program.

★ ★ ★

AN INSTITUTE ON THE ECONOMICS OF DEFENSE MOBILIZATION is being conducted in Washington by the American University in cooperation with the Office of Defense Mobilization. In a series of sixteen Tuesday evening sessions, top spokesmen for each mobilization agency explain the organization and operation of their particular agency and its impact on the general economy. Questions from the audience are answered. Top officials of the Munitions Board spoke at the session of November 13. Transcripts of the entire proceedings can be procured from Prof Davis S. Fields, Department of Economics and Business Administration, American University, 1901 F St., N.W., Washington, D. C.

. . . N.T.D.M.A., from page 90

of Unions' demands," Eugene B. Schwartz, well-known labor relations attorney of Cleveland, told the annual meeting. Mr. Schwartz pointed out that this tendency could work a serious hardship on employers caught in the squeeze between price control and wage stabilization increases. Mr. Schwartz singled out the dock strike in New York as another important 'straw in the wind' in the labor-management picture. He said that "if labor leaders cannot or will not control their membership, it would appear that a labor contract is only a scrap of paper. Such a theory would lead us to industrial ruin."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(NOTE: "Height of Holder" is distance from bottom of holder to center of lathe.)
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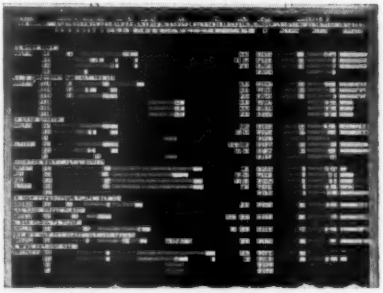
Standardized Visual Control Boards

To expedite layout, assembly and delivery of its "look *at* the facts instead of *for* them" visual control boards to meet defense program needs, Visi-Trol Corp. has standardized all components for these boards.

Component parts for Visi-Trol boards are now carried in stock and include: steel channels in several widths; plastic letters, figures and strips; mouldings and accessories. Shapes and dimensions selected were based on an extensive study covering many applications in the visual control of scheduling, quality, purchasing, inventory, machine and plant loads, budgets, etc.



As a result of this development, the company can now custom-assemble at short notice, and at minimum cost to the user, visual control boards covering an almost unlimited variety of industrial needs. In addition, any Visi-Trol control system can be revised, developed or expanded while in use to fit changing conditions without requiring the replacing of the entire system.

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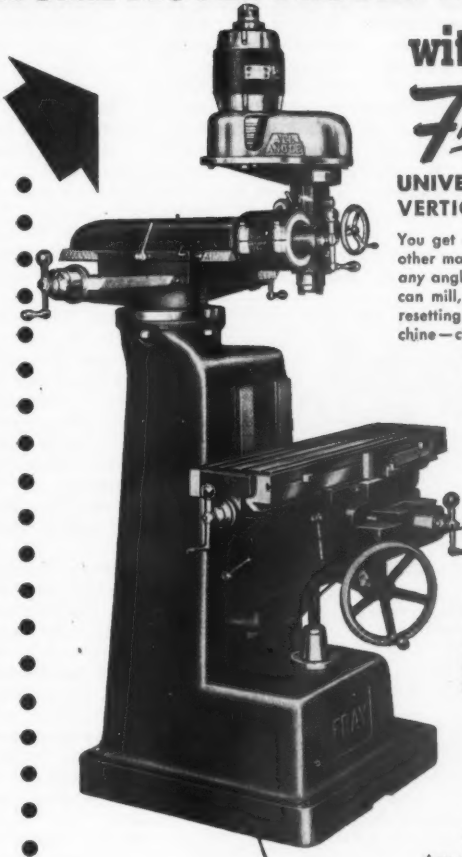

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

1952 Outlook . . .

Machine Tool Shortage Is Top Problem

The machine tool shortage has been one of this year's top mobilization problems and despite sharply rising production rates, there is little promise of relief in 1952, a Defense Production Administration - National Production Authority study reveals.

The situation is as acute as during the hottest days of World War II. At present, the industry is actually smaller than it was when the United States entered the war. At that time, the machine tool industry had already expanded and for two years had been producing for those nations at war with Germany.

During the first year after Korea, machine tool production lagged, and among the counts cited were: price controls, difficulties in procuring materials and components, lack of easy financing, a manpower shortage, and lack of definite information on the future needs of the mobilization problem.

To break these "bottlenecks within the machine tool bottleneck," Defense Mobilization Director Charles E. Wilson, in July of this year, directed six mobilization agencies to do something about them.

Where it has been possible to do so, these agencies have cleared the way for greater production.

Two areas, however provide particular difficulties: information of future machine tools needs, and manpower.

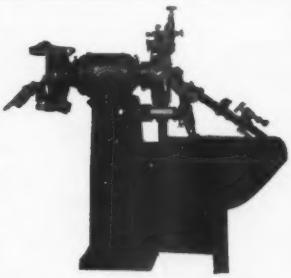
It is not unusual for two or three different contractors, building the same item, to use a different production method and a different machine tool. This has made most difficult the problem of forecasting future machine tool needs.

Three agencies are engaged in projects aimed at shortening the tooling up period.

The Munitions Board is compiling a list of anticipated machine tool needs. Such a list will result in a more efficient operation of the General Services

Small drill holder on left adapts drills from No. 60 to 3/8 inch for dry grinding.

Large drill holder on right end is for drills up to 2½ inches and can be used wet or dry. Machine can also be furnished without pan and pump. Bench and pedestal type machines also available for smaller size drills.



Drills MUST be Sharp and— Correctly Ground!

Drills that are sharp and correctly ground will (1) drill to exact size (2) drill faster (3) drill more holes per grind (4) drill the same with each lip (5) require less power to drill (6) reduce breakage (7) cost less to regrind and increase the life of drill by removing less metal when grinding. HISEY Drill Grinders are designed to grind drills correctly and quickly with inexperienced operators.

ASK FOR CATALOG 71-TL

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Administration's "pool order" contract program, under which the Government, anticipating future needs, places orders for machine tools with the understanding that if the machine tool builder doesn't sell the tool to private industry, the Government will buy.

The National Production Authority has requested defense contractors to screen their machine tool requirements to see if a simpler tool cannot be used in place of a more complex one.

Mr. Wilson's third quarterly report, for example, tells of one manufacturer who placed orders for 400 scarce tools but, as a result of a restudy by his engineers, managed to reduce his needs to about 60 key tools.

Manpower remains one of the greatest problems faced by the industry. Highly skilled mechanics are needed. It sometimes happens that a machine tool builder will hire a "learner" at $1.50 an hour and after a month or two the learner is lured away by another industry paying $1.90 an hour.

The Bureau of Labor Statistics has estimated that the machine tool industry will have to have about 50 per cent more workers and institute a longer workweek if it is to carry its production load.

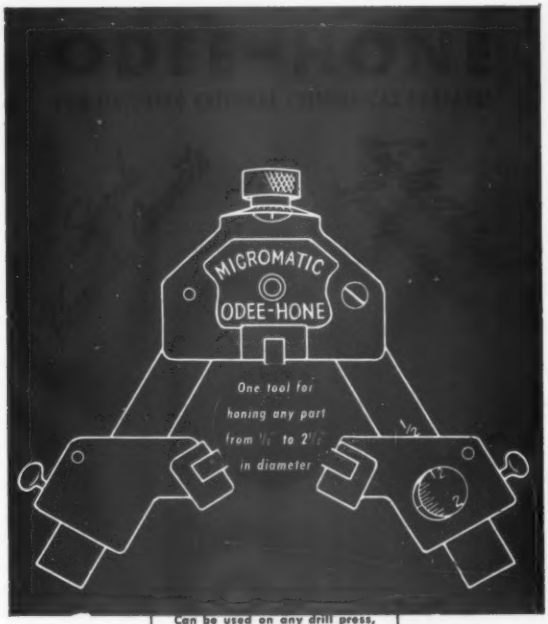
Industry now places the backlog of orders at $1,371,370,000, or more than two years' production at the present annual production rate of $650,000,000.

About 70 per cent of the backlog is for contractors producing essential defense items.

Military spending for machine tools during Fiscal 1952 is expected to increase sharply, approaching a rate equal to that of peak World War II spending.

For the less complex type of tool, however, the picture is considerably brighter, and deliveries on some—twist drills, for example—are current.

The study indicates that a climax will probably be reached sometime in late 1952 or early 1953, after which production will be high enough to work off the backlog of orders, gradually easing the machine tool problem.



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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Duplicator Method Speeds Mold Machining

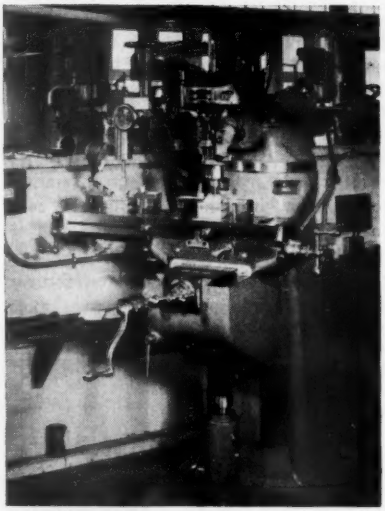
During the past several years, hydraulic duplicating attachments have made phenomenal advances in saving time, cost and materials involved in mass production or job lot duplicating operations.

The attachment shown here can be quickly detached, to permit straight milling or jig boring jobs to proceed without interference. For the metal removing feed, Turchan equipment employs hydraulic power, which insures a positive drive, free of lost motion and backlash, hence accurately responsive to the control "dictated" by variations in the mold profile being duplicated.

The combination of a tracer point or spindle and hydraulic two-way valve comprises the means for governing the hydraulic power feed; and it is the design, construction and performance of the tracer-actuated valve as a rugged but truly precision instrument that insures the extreme accuracy possible in mold making and profiling.

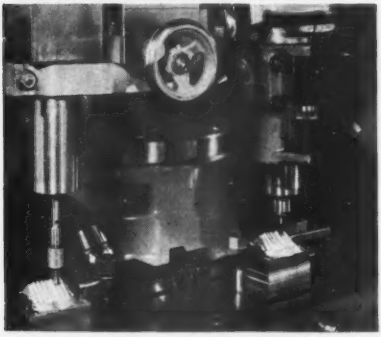
The hydraulic circuit ports are machined into the piston and sleeve, so their relationship never varies. The "porting" action of the valve within its sleeve is governed by the tracer point or spindle, as it in turn traverses the profile of the master mold.

A wide range of adjustment is provided for the tracer spindle and valve unit. Final orientation of the spindle and cutter with the master workpiece, respectively is attained by the vertical screw and hand-wheel and the 90 micrometer cross-feeds that carry the tracer valve body. This means that the master model and the block of mold steel do not have to be painstakingly located or relocated in the same plane, or indexed from a reference surface such as the edge of the table.



Hydraulic duplicating attachment as applied to a vertical milling machine.

Setup details of plastic toy mold section going through duplicating process.



Photos courtesy Turchan Follower Machine Company

The accompanying pictures show a mold part as it is going through the duplicating process. The master and part being cut is a seat core section to be used as part of a mold for a plastic toy.

It would require many different setups, a frequent shifting of the core while being machined, and constant checking to produce this core without a duplicator. After conventional machining, some hand tool work would be necessary to bring the part down to final dimensions. In total, the time spent on this part, including final polishing, would be at least 24 hours.

With the follower attachment, in this case, the total time was reduced to approximately 12 hours.

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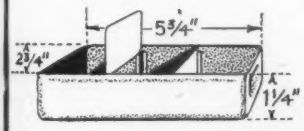

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This new mobile means of inspection saves countless man hours in the movement of gages, since gages can be okayed right on the job, or if found to be worn, can be replaced from the mobile unit. This also makes possible a much smaller inventory of gages and by means of records, better control is maintained over the gages through regular mobile inspection.

Under the mobile inspection system a complete set of gages and fixtures is maintained at each machine. These gages either pass or reject the work accomplished on this machine. Each gage or gaging fixture is marked usually with an identifying color, which determines the regularity with which the roving inspector checks this gage. At regular intervals the roving inspector takes the mobile unit along his route, checking the gages at each machine; those gages with extremely close limits are checked more often then gages with wider limits.

At the time the system of Mobile Inspection was introduced, a Mobile Inspection Cabinet was developed. The key to the new inspection system is this mobile unit by means of which all of the inspector's tools and measuring instruments are moved from one location to the next.

A new, smaller, lighter and easier-to-handle Mobile Unit, shown in the illustration, has been designed. It is 37" high, 28" wide, and 18" deep, which makes it easy to maneuver through closely placed machines and parts. It is constructed of heavy-guage welded steel and has a pressed wood top which provides an ideal surface for gage inspection plus being a very good protection against gages and instruments which are placed or dropped on it. There is a ledge around the top which prevents tools and gages from sliding off to the floor. The five drawers which it has are roller mounted and are locked with a single lock on the top drawer. It has a convenient tow handle for moving the unit from place to place on free rolling swivel-casters, two of which are equipped with brakes. An adjustable light provides illumination for the entire top surface and is connected to a 25-foot extension cord which can be pulled out of a spring operated take-up reel. Additional receptacles are provided to supply current for a magnifying attachment, monochromatic light, electric comparator, or any other electrical instruments to be used.

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Photo courtesy The DoALL Company

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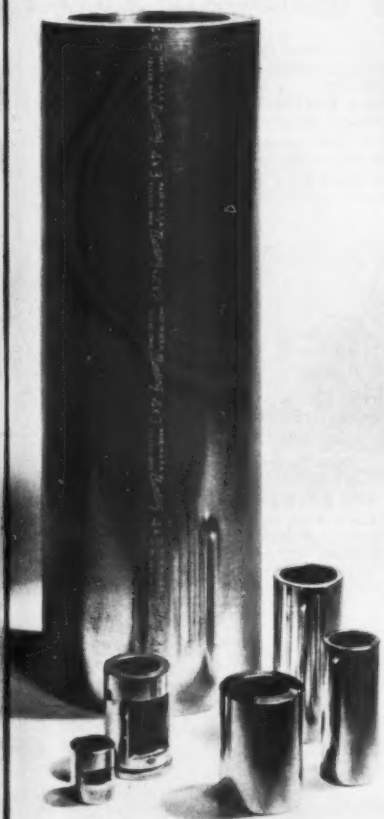

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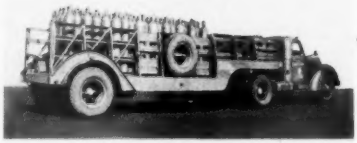

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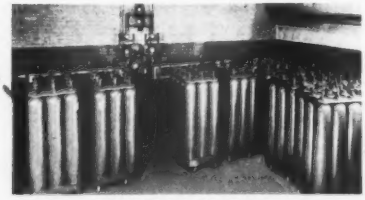

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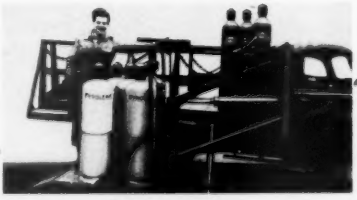

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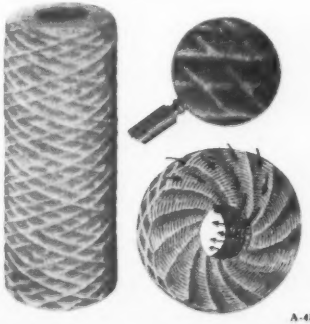

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Sixty-Six Hints to simplify design and reduce spring costs are given in Newcomb's eight-page Bulletin NS 500. Specific hints are given on purchasing, materials, finishes, gages etc. THE NEWCOMB SPRING CORP., 3902 Seventh Ave., Brooklyn 32, N. Y.

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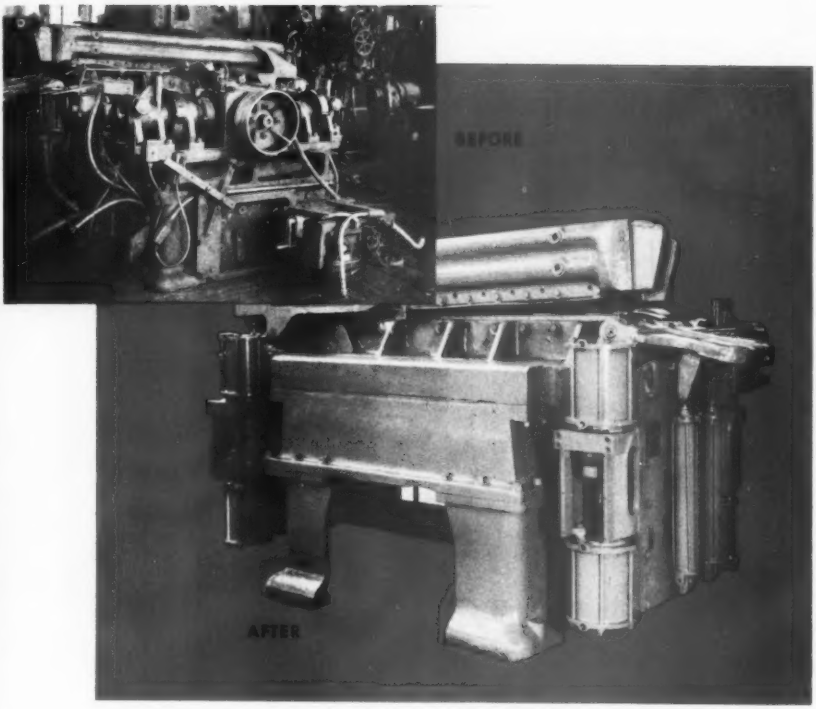

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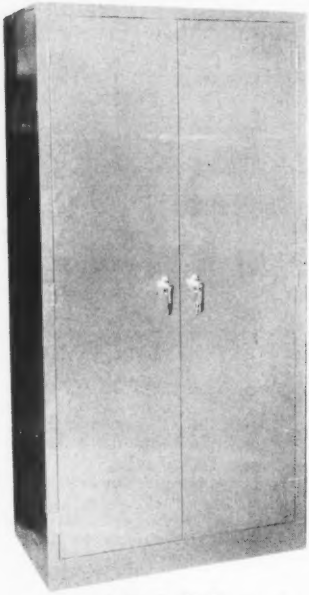

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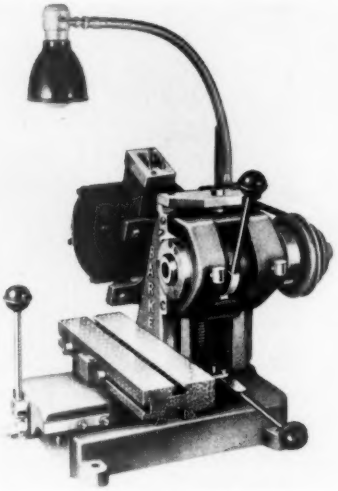
It embodies the advantages of longitudinal table travel, transverse saddle travel and vertical head travel by hand lever operation on the production model (illustrated), or by accurately calibrated micrometer feed screws on the toolroom



model. Any one or more of the three travels can be furnished with micrometer feed screw in place of the hand lever.

The Barker Miller is capable of high production when fitted with proper production fixtures, and high spindle speeds make it excellent for use with carbide cutters.

This versatile machine can be operated with precision results by inexperienced help—a big factor with today's prevailing labor conditions.

A detailed bulletin is offered by THE BARKER ENGINEERING CO., 500 Green Rd., Cleveland 21, Ohio.
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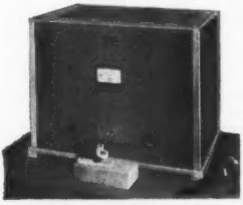

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. . . Angular Setups, from page 57

plane, P_2 is on the z-axis, and P_3 is located in the zx-plane. Hinge P_2H_2 can be located by passing a horizontal plane through P_2. Draw plane $P_3R_2T_2$ perpendicular to P_2H_2. Angle θ will be the rotation about the hinge. Angle ψ is the angle between hinge and side O_2O_3 of the body, and ϕ is the angle between the hinge and the ways.

Consider tetrahedron $P_2T_2R_2P_3$:

$$P_3T_2 = \frac{R_2T_2}{\cos\theta}$$

$$P_2T_2 = \frac{R_2T_2}{\tan\psi}$$

The foregoing equations can be combined to give:

$$\tan\phi = \frac{\tan\psi}{\cos\theta} \quad \ldots\ldots\ldots\ldots\ldots\ldots (39)$$

The solution by analytical geometry is similar to the first case considered.

The Euler equations can be applied equally well when P_2P_3 is made parallel to the ways. In Figure 8, the coordinates of the points are $P_1\,(x_1, y_1, O)$, $P_2\,(O, O, z_2)$, and $P_3\,(x_3, O, z_3)$. Elimination by the same steps previously used will give:

$$\tan\psi = \frac{y_1\,(z_2 - z_3)}{x_3z_2 - x_1\,(z_2 - z_3)} \quad \ldots\ldots (40)$$

$$\tan\theta = \frac{z_2 - z_3}{x_3\sin\psi} \quad \ldots\ldots\ldots\ldots\ldots (41)$$

$$\tan\phi = -\frac{x_3\sin\psi\cos\theta + (z_2 - z_3)\sin\theta}{x_3\cos\psi} \quad \ldots\ldots\ldots (42)$$

Shaper

Suppose the work on surface $P_1P_2P_3$ is to be done on a shaper instead of a milling machine. Figure 9 shows the workpiece properly mounted to make the surface horizontal and line P_1P_2 parallel to the ways of the machine. With the table horizontal, $(\lambda = \gamma = O)$, the body is first located so that line O_1O_2 is parallel to the ways. Plane $O_1O_2P_2P_1$ will then be vertical. Rotation of the rocker through a suitable angle γ will make line P_1P_2 parallel to the ways. The box table is now rotated through angle λ until surface $P_1P_2P_3$ becomes horizontal.

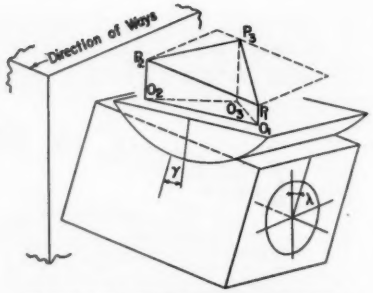

Fig 9. Workpiece Mounted on Shaper Preparatory to Machining

The values of γ and λ can be formed by reference to Figure 10 where the coordinates for P_1, P_2, and P_3 are taken as in Figure 3. Pass plane P_3R_1LG parallel to the yz-plane and draw line FG parallel to the xy-plane. Draw plane EFG perpendicular to P_1P_2. Let P_3E be the trace of plane $P_1P_2P_3$ in the zx-plane. It is parallel to line P_1P_2. Line EF will be located at angle γ with P_3F.

Angle γ can be found by Equation (3). Length P_3F is easily found by trigonometry. The following equations can be written for tetrahedron P_3EFG:

$$EF = P_3F\cos\gamma$$

$$y_1 = FG = \frac{P_3F}{\tan\varepsilon}$$

$$\tan\lambda = \frac{EF}{FG}$$

The first of the above equations should be substituted into the third one to give:

$$\tan\lambda = \cos\gamma\tan\varepsilon \quad \ldots\ldots\ldots\ldots (43)$$

Another equation for finding angle λ can be had from analytic geometry.

(Continued on page 108)

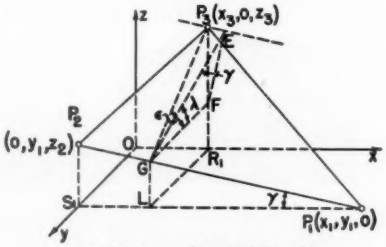

Fig 10. Geometric Relationships

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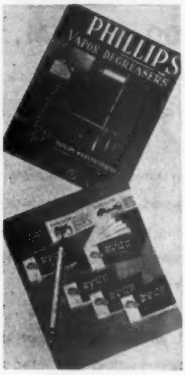
Porter-Cable's new, 28-page catalog on abrasive-belt grinding is also a detailed, illustrated manual on the subject.
Circle No. E1.

MILLING
A colorful catalog from Marvin Machine Products, Inc., covers a line of milling and slotting attachments, dividing heads, rotary tables, etc.
Circle No. E2.

DISTOMETER
This instrument for measuring the working length during lathe operation is presented in a William Scott Machinery Co. brochure.
Circle No. E3.

FLAT SPRINGS
Universal Metal Products, Inc., has issued an attractive bulletin, No. 101, describing and picturing springs, wire forms, stampings, etc.
Circle No. E4.



DEGREASING
Photographs showing industrial applications of Phillips Degreasers are contained in a 12-page bulletin. The process itself is explained.
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MACHINE TOOLS
"Pygmy size" Catalogs 5104 and 5119 picture and describe practically the entire line of South Bend machine tools and lathes, respectively. Small but legible.
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STAMPINGS
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ENGRAVING
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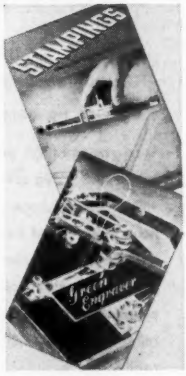

AIR PRESSES
Twenty standard models are described as to dimensions and specifications in Famco Machine's Air Press Catalog. Features are pointed out.
Circle No. E9.

SNAP GAGES
Pratt & Whitney presents Circular 460-3 on their AGD adjustable Limit Snap Gages, made to American Gage Design standards.
Circle No. E10.

DRILLING
All modifications recently made to Taylor's "HI-EFF" line of Sensitive Precision Drilling Machines are detailed in new Bulletin 181.
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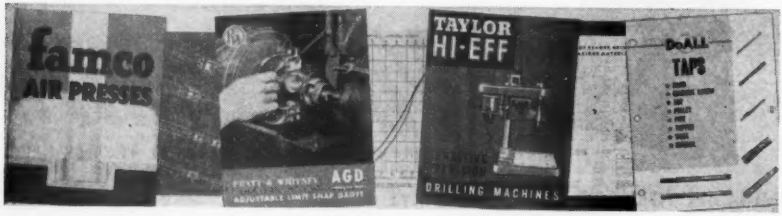
TAPS
Nine pages of technical data and ordering information are included in DoALL's 16-page Catalog 51-813. It also has complete specifications.
Circle No. E12.



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Bay State Abrasive Products Company's new, 26-page catalog fully covers Bayflex, DuraCut and Saf-T-Cut Reinforced Resinoid Products.
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High speed copying can cut your machining costs. This brochure describes several French-made models offered by H.E.B. Machine Tools.
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The Commander Tapper is featured in an attractive, new publication that also describes the Multi-Drill, Multi-Angle Drill Unit, etc.
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Here's an interesting folder introducing Rampe's cost-cutting, universal, portable Tumbler-Mixer. It tumbles solids or mixes liquids.
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Carborundum Company has issued a 70-page booklet packed with suggestions for proper maintenance of alloy and high speed tools.
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SHAPER

Specifications and other data on the Sheldon No. 8000 Shaper and TS-56B Precision Lathe are listed in an illustrated bulletin by the manufacturer.
Circle No. E18.

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Ideas on how to establish more efficient materials handling procedures are outlined in Clark's "Basic Facts About Materials Handling."
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MILLING ATTACHMENTS

Brown Milling Attachments, built in 25 models and sizes, are pictured and described in a current, six-page brochure.
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The General Drill Feed is a "Time-Saver" in practice as well as in name. A folder describes this automatic power feed for drill presses.
Circle No. E22.

SOCKET SCREWS

Full information on all Holo-Krome socket screw products is contained in 28-page Catalog No. 51. Engineering data are a special feature.
Circle No. E23.

"IRON HAND"

Sahlin's automatic unloader for presses, brakes, shears, etc., is the highlight of a detailed catalog. Pictures shows exactly how it works.
Circle No. E24.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Angular Setups, from page 104

Pass a plane through line P_1P_2 and FG. The equation for this plane will have the form:

$$A_2x + B_2y + C_2z + D_2 = 0 \quad \ldots\ldots (44)$$

The coefficients can be found by the previously explained method. Coefficient B_2 will come out equal to zero. Angle λ, which lies between the plane of Equation (44) and plane $P_1P_2P_3$, is given by the following equation:

$$\cos\lambda = \frac{AA_2 + CC_2}{\pm\sqrt{A_2 + B_2 + C_2} \times \mp\sqrt{A^2_2 + C^2_2}} \quad \ldots\ldots (45)$$

In the denominator, use the sign for each radical opposite to that of the corresponding D.

Example 4. Find values of λ and γ for the shaper. Data for the plane is the same as for **Example 1.**

Solution.

$$GL = \frac{LP_1 \times P_2S_1}{S_1P_1} = \frac{5.81 \times 1.65}{7.78} =$$

1.23220 in.

$$P_3F = 3.36 - 1.23220 = 2.12780$$

$$\tan\varepsilon = \frac{2.12780}{4.32} = 0.492$$

$$\tan\gamma = \frac{1.65}{7.78} = 0.212$$

$$\gamma = 11.9740°$$

In Equation (43), $\tan\lambda = \cos\gamma \tan\varepsilon = 0.0978 \times 0.492 = 0.481$

$$\lambda = 25.7261°$$

To solve for λ by Equation (45), proceed as follows: Coordinates for P_1, P_2 and F (1.97, 0, 1.2322) should be substituted into Equation (44):

$$7.78A_2 + 4.32B_2 + D_2 = 0$$
$$4.32B_2 + 1.65C_2 + D_2 = 0$$
$$1.97A_2 + 1.2322C_2 + D_2 = 0$$

These equations are now solved for the coefficients:

$$A_2 = -0.128D_2$$
$$B_2 = 0$$
$$C_2 = -0.606D_2$$

When the values for A_2, B_2, and C_2 are substituted into Equation (44), the resulting equation for plane P_1P_2F can be written as:

$$x + 4.715z - 7.78 = 0$$

The equation for plane $P_1P_2P_3$ as found in **Example 2** is:

$$x + 2.322y + 4.715z - 17.812 = 0$$

Substitution should now be made in Equation (45). The value for the first radical of the denominator is the same as in **Example 2.**

$$\cos\lambda = \frac{1 + 4.715 \times 4.715}{5.350\sqrt{1^2 + 4.715^2}} = 0.900$$

$$\lambda = 25.7262°$$

Conclusion

The foregoing paper shows that the application of simple algebra and trigonometry will give a direct solution to the problem of determining the machining angles for an arbitrarily located inclined plane.

BIBLIOGRAPHY

1. Wolfe, J. H. and Phelps, E. R., "Practical Shop Mathematics, Vol. II", New York, McGraw-Hill Book Company, Inc., 1939.

★ ★ ★ ★ ★

DPA Delays Pre-Certification Requirement Until January 1

The Defense Production Administration has postponed for two months, until Jan. 1, 1952, its requirement of pre-certification of new plant construction to obtain certificates of necessity for rapid tax amortization.

Thus, companies that begin construction of new industrial facilities before the first of the new year may apply for rapid tax amortization without having obtained prior approval of the projects.

A formal priorities system for processing applications, based on the essentiality of the product involved, is being established. Treatment within priority groups will be based on the extent of the particular shortage involved and the degree to which already certified projects have reduced it.

Initially, priority treatment will be given applications involving production of facilities in the following sequence: 1. Machine tools, cutting tools, dies, gages, jigs and fixtures; 2. Ores, such as copper, lead and zinc; 3. Pig iron; 4. Sulfur; 5. Military end items and supporting products urgently needed by the Armed Services; 6. Basic aluminum; 7. Nitrogen; 8. Aviation gasoline; 9. Steel scrap; 10. Special aluminum extrusions.

Atomic Energy projects also will receive special priority treatment.

The Defense Production Administration emphasized that the sequence of priorities and the priorities themselves will be revised from time to time as conditions warrant.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Die Casting Die, from page 68

to the channel from the main die cavity may become sealed by a film of solidified metal thus preventing the entrance of metal into the overflow cavity.

In the case where an overflow is employed to function as a collector for entrapped air, it is not necessary that the overflow be filled with metal. All that is necessary is that the channel be large enough to permit the passage of air from the main die cavity to the overflow.

Proximity of Overflow to Main Die Cavity

An overflow should never be situated closer than a quarter of an inch from the main die cavity. When an overflow is closer than this distance, its presence is likely to cause both local overheating of the main die cavity and considerable difficulty in trimming the overflows from the die casting proper.

In addition, if an overflow is placed too close to the die cavity, the steel partition between the overflow and the main die cavity may become overly hot and in so doing may cause a heat blister, or blisters, to appear on the surface of the die casting adjacent to the overflow. Furthermore, as the steel bridge becomes narrower as the channel becomes shorter in length, the exposed face, Figure 82, becomes more prone to mechanical abrasion, wear, and deformation by the molten alloy flowing across its face.

Overflows may perform one or more of their intended functions properly when placed as much as three to four inches away from the main die cavity. It need only be remembered that as the length of the channel increases, its cross-sectional area should also increase in order to assure the proper filling of the overflow, particularly if the overflow is to serve as a heating element.

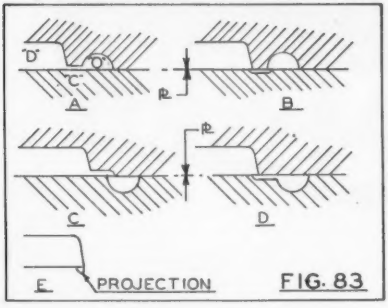

FIG. 83

Figure 83 illustrates diagrammatically how an overflow, O, may have its channel, C, join the main die cavity, D.

In the case where the main die cavity to be joined by the channel lies in one die half only, as in A, B, C, and D the overflow may be cut in either die half, i.e., A and B have the overflow cut in the same half of the die in which the main die cavity has been located, while in C and D the overflow has been cut into the opposite die half. The channel may be cut into either die half irrespective of the location of either overflow or main die cavity. Thus the channel in A and C are cut in the upper die half, while the channel in B and D are cut in the lower die half.

We have already reviewed the reasons for cutting the overflow in one die half as opposed to the other; let us now briefly examine the reasons for cutting the channel in one side or another.

As in the case of the feed leading from the runner to the gate of the casting proper, the channel must of course open into the main die cavity. It can do this directly into the side wall of the main die cavity as shown in A and C, or it can open into the main die cavity from the face of the main die cavity as shown in B and D. When the channel joins the main die cavity from the side as in A and C, it is easily trimmed mechanically and leaves no more than a trimmed area; however, when the channel opens up into the main die cavity from the face as in B and D, a single mechanical trimming operation will not suffice to trim off the tit left on the casting as shown at E, Figure 83. This tit must be removed by still another operation.

As in the case of the feed leading from the runner proper to the main die cavity, it may prove advantageous to have the feed open into the die cavity from the face rather than from the side; however, in the case of the overflow channel the writer believes there is never any reason to have the channel join the main die cavity anywhere but on the side face.

(Continued on page 114)

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Punch and Die for Forming a Heater Part

by Robert Mawson
Providence, R. I.

In order to obtain interchangeable parts going into the manufacture of sheet metal heaters, it has been found more economical to produce some of them out of sheet metal by stamping and forming in well designed dies. The interchangeability of parts makes possible a lower assembly cost of the heater units and at the same time provide a supply of repair parts which can be easily and quickly installed.

Figure 1 shows such a part, known as a valve stem guide. It is made from #26 gauge (.017) Terne sheet steel strip stock, $\frac{13}{16}$" wide.

The guide is produced in one operation which consists of cut-off and forming. Figure 2 shows the punch and die used for this operation as it would be set up in a punch press. The sequence of operations is as follows: as the steel strip stock is fed into the press, it is guided and centered over the lower section of the die by die gages. At the beginning of the operation cycle, the ram descends and brings the top section of the die in contact with the stock, thus gripping the stock between the upper die and the pressure pad in the lower section of the die. As the top die continues to descend, a section of stock 3.250" long is sheared off by being pushed down into the outer ring of the bottom die. This piece of stock, which is held securely between the upper die and the pressure pad, is then pulled down over the post located in the center of the lower section of the die as the ram continues to descend. This gives the part its form. Just before the die is fully closed, the punch shown in the center of the upper section of the die pierces the hole. The slugs drop through the center of the post, through the die set, and falls through the bolster and out the bottom of the press.

As the ram rises, the finished part remains inside the upper die (indicated

(Continued on page 116)

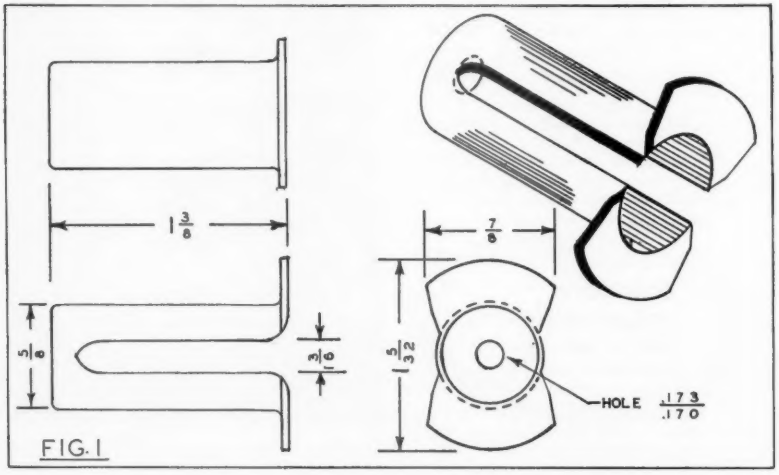

FIG. 1

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. . . Die Casting Die, from page 110

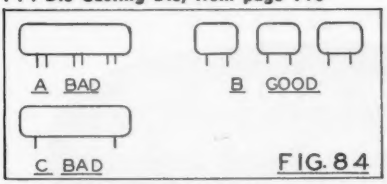


FIG. 84

Multiple Feeds

Multiple channels leading into a single overflow are to be avoided, Figure 84-A. Every overflow should have but one channel, Figure 84-B. Multiple channels leading into one overflow serve little purpose as the metal usually fills the overflow through one channel anyway while the others merely clog up with frozen metal. This is also true of too wide a channel, Figure 84-C, because the metal will choke off in one section of it while passing metal through another portion of it.

Venting Overflows

All overflows should have vents leading from them to the edge of the die face. These vents should be designed precisely as if they were leading out from the main die cavity (see a following discussion of vents).

Ejecting Overflows

Overflows cut into the stationary die half only, must be of such a nature that when the die opens they free themselves readily from this die face without sticking. Otherwise they might remain stuck in their respective cavity in the stationary die half from which they subsequently must be pried loose by hand before the die may be closed and the casting cycle repeated.

If an overflow sticks to the stationary die face as the die halves open, the die casting proper may be partially twisted out of its seat in the movable die half. Even though the bond between the stuck overflow and the die casting proper is broken, the die casting may have become so twisted before the bond (or channel) was broken, that serious difficulty arises in attempting to properly eject the die casting from its die cavity. This is due to its having become cocked in such a way that it is not free to be ejected smoothly without binding.

To facilitate the free withdrawal of an overflow from its cavity in a stationary die half, the side walls of the overflow are given plenty of draft, (1½-2½° per side) Figure 85. Frequently an ejector pad boss cavity is cut into the movable die half just opposite the overflow cavity cut in the stationary die face, as shown in Figure 86-A. Such a boss is usually slightly larger in diameter than the ejector pin that pushes against it and is usually cut with a maximum of ½° draft per side. Therefore, as the die opens, the overflow is withdrawn from the stationary die half by a force tending to prevent the ejector pad boss from lifting out of its cavity on the opposite die face wherein it is held by frictional forces due to the presence of minimum draft on its side walls.

One more factor tends to assist in withdrawing an overflow formed in the stationary die half from its cavity: the physical connection, formed by the channel, of the overflow to the die casting proper. In effect, the overflow is an appendage of the die casting proper and as such is pulled away from the stationary die face by its attachment to the casting which itself is withdrawn from the stationary die half.

(Continued on page 118)

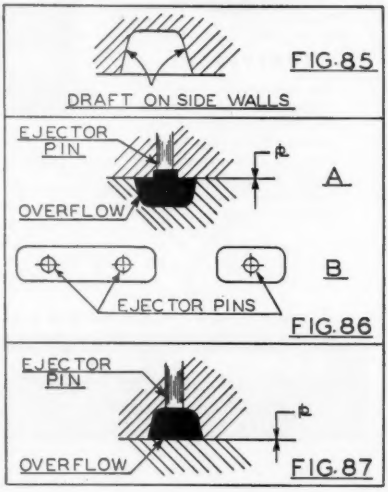
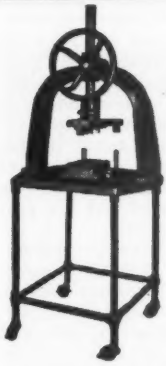


FIG. 85
FIG. 86
FIG. 87



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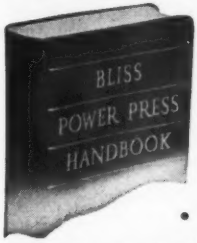

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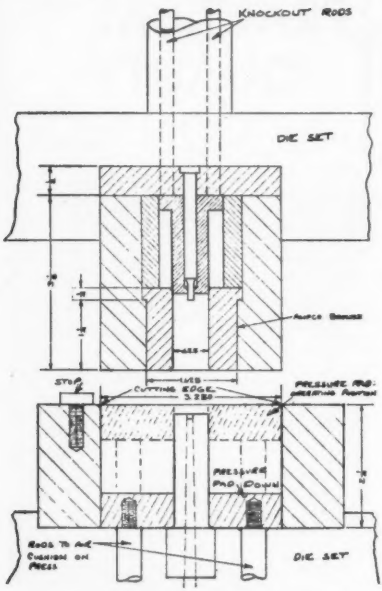
. . . Punch and Die, from page 112



by the .625" dimension) until just before the ram reaches the top of its stroke. At this point, the knockout rods push the part down out of the die and then ejected.

By running this job on an inclinable press, the part is kept from falling back into the bottom section of the die. Removal of the finished pieces and scrap is also helped by a blast of compressed air controlled by a mechanism on the crankshaft of the press. The nozzle of the air line is directed to blow into the front of the die at the instant the part is ejected from the top die.

The two rods shown in the bottom section of the die extend through the bolster plate of the press to an air cushion. The air pressure in the cushion is adjustable so that the pressure on the pad may be varied until the proper setting is found for the type of material being used. This setting is important, since too much pressure will cause the parts to tear and too little will allow the stock to slip, causing the parts to be improperly formed. This setting must be varied according to the thickness and hardness of the material being used, but ordinarily the material in any given lot may be run on one adjustment.

This well designed punch and die produces the valve stem guide to satisfactorily meet the blue print specifications at a low manufacturing cost and is considered an efficient piece of production tool equipment.

★ ★ ★ ★ ★

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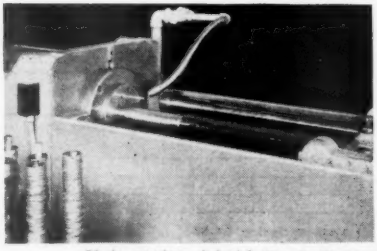

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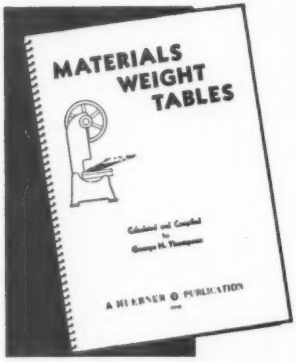

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Die Casting Die, from page 114

Mention must be made here of the fact that there are occasions when the reverse of the foregoing is true, i.e. overflows are deliberately cut into the movable die half and their physical connection to the die casting keeps the die casting from sticking to the stationary die half.

Overflows cut into the stationary die face may or may not have ejector pins opposite them in the movable die half, for ordinarily they tend to shrink away from their cavity walls thus automatically freeing themselves.

The same is true of overflows cut in the movable die half. If the walls of their cavity are sufficiently tapered, the overflows will cling to the die casting proper as it is ejected from the movable die half. It is considered good design practice however to employ one or more ejector pins to force an overflow out of its cavity so as to avoid having it stick in its cavity even momentarily, and in so doing tend to distort the die casting, Figure 86-B.

There is no need to employ an ejector pad boss when the overflow lies in the movable die half, and the face of the ejector pin should be flush with the face of the overflow cavity face, Figure 87.

Overflows and Mechanical Strength

Before concluding our discussion of the function of overflows, reference must be made to the fact that use of overflows with extra large channels in certain instances can effect very marked improvement in the mechanical properties of die castings by promoting superior microstructures within the die casting. For a more detailed discussion of this advantage to the use of overflows read "Pressure Die Castings," LIGHT METALS, (London) April, July, October 1945, by the writer.

Powdered Metal Overflows

To facilitate the escape of entrapped air from a die cavity, overflows may be cut into blocks made out of very porous powdered metal which are inserted into the main die block. The trapped air passes from the die cavity through the channel into the overflow where it in turn passes through the porous metal insert and out of the die.

Overflows: Before or After Trial Run

Unless past experience dictates where overflows should be situated it is best not to employ them in connection with the production of a die casting until after the trial running of the die has been completed, for it is best to avoid the use of overflows unless it is necessary.

In many instances, the die castings will be quite similar in design to those previously produced and therefore it will be logical to follow previous experience and employ overflows in a manner dictated by former experience. A mere similarity is not enough however to justify the duplication of former overflow placement; in cases of general similarity the die casting die designer may have the die maker cut the overflow cavities in place, but omit cutting the overflow channels into the die face. These channels can then be cut during the trial run if they are found to be necessary. Cutting overflows in ahead of time often saves trial run time.

When a part to be die cast is unique in design, it is best, however, to refrain from the use or even the cutting of their cavities until the trial running of the die.

The writer would like to emphasize the importance of the employment of overflows only as a last resort. Overflows should really be used only after all other factors affecting the quality of production have been exhaustively varied to no avail. It is too often the case that the overflow is thought of by designers as a "cure-all". Nothing could be farther from the truth for as we shall see presently the use of overflows has several disadvantages. Before putting in overflows to correct the many defects which some die casters unfortunately feel are best eliminated through their use, the die casting engineer should be certain that he has chosen the optimum (1) gating, (2) venting, (3) operating temperature for the die, (4) water cooling, (5) casting temperature, (6) casting cycle, etc.

Here are a few words of caution to those designing die casting dies. Once the die is completed and the trial run reveals the need for overflows, keep in mind that:

(Continued on page 132)

THIS Baldor GRINDER

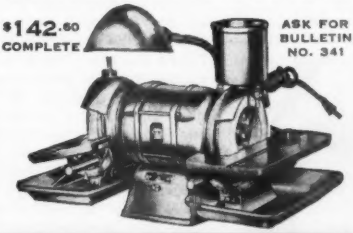
is made especially for precision grinding of

CARBIDE TOOLS

BALDOR Carbide Tool Grinder No. 500 has balanced armature and wheels; large ball-bearings; ½ hp, 3400 rpm reversible motor; 6" silicon carbide wheels.

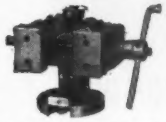
BALDOR ELECTRIC COMPANY
Electrical Specialists Since 1920
4369 Duncan Ave. St. Louis 10, Mo.

$142.60 COMPLETE



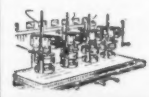
ASK FOR BULLETIN NO. 341

"JOHN'S"
DRILL JIGS
FOR
DRILLING
TAPPING
MILLING
ANY SIZE PARTS



- 3 sizes, 6", 8", 14".
- Universal jaws take diameters ⅛" to ¾".
- Precise centering.
- Fast load, unload.
- Rigid clamping.
- Plenty of chip room.

ACCURATE
LOW-COST
HIGH-SPEED
PRODUCTION



Write for Details

Manufactured By
HEUSER MFG. CO.
1618 N. Paulina St. Chicago 22, Ill.

Dovetail Cutters by *Reltool*...
Available from Stock

Order these shank type dovetail cutters from your industrial distributor, or direct, for use in Reltool and other standard End Mill Holders. May be used in place of arbor-type and threaded-hole angle cutters. The ideal tool for milling dovetails with less set-up time, easier handling.

The Reltool Line Includes: Arbors • Center Drills • Counterbores • Die Sinking Cutters • Dovetail Cutters • End Mills • Form Tools • Gear Cutters • Hollow Mills • Keller Cutters • Key Seat Cutters • Lathe Mandrels • Metal Slitting Saws • Milling Cutters — all types • Reamers • Spotfacers • Step Drills • Taps • Tool Bits • Specials. Write for Catalog 50.

Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Warplis Rod and Flat Stock are available in nearly 400 stock sizes from Pittsburgh Tool Steel Wire Co. Made of oil hardening, non-warping, cold melt electric furnace tool steel, they are precision ground, true to size and selection. Descriptive folders have been prepared. **Inform-A-Gram No. B1.**

The B&L Contour Measuring Projector permits angular measurements to ± 1 minute of arc, with protractor screen; and direct linear measurements to ± .0001" over 4" x 6" range, with cross slide stage. Bausch & Lomb Optical Co. offers illustrated Catalog D-27. **Inform-A-Gram No. B2.**

Photo shows plate glass pushed against resilient air-inflated wheel. Note large abrasive contact area—up to 3000% more! This means a corresponding production increase.

...how to INCREASE BUFFING, POLISHING PRODUCTION 3000%

● You can boost your buffing and polishing output up to 3000% on flat work ... and 600 to 700% on contours ... by using this resilient air-inflated wheel. Many other advantages such as—*no chatter or bounce ... eliminates under-cuts ... produces a straight pattern similar to a hand finish.* For use on portable tools or bench-stands—wherever ordinary polishing wheels are used. Send NOW for free literature and name of distributor nearest you. Nu-Matic Grinders, Inc., 8225 Carnegie Ave., Cleveland 3, Ohio.

send for full information TODAY!

NU-MATIC *Air-Inflated* GRINDERS

"Applications of Tracer Control" is a 64-page book containing more than 200 photographs and over 140 specific descriptions and production facts about a wide variety of production jobs that are being done better with Gorton Tracer Control. It features the complete, illustrated story of the "smallest engraving in the world"—the Lord's Prayer, Gorton engraved on the **point** of a pin, within a circle .005" dia. This book also demonstrates the wide range of workpiece sizes accommodated by Gorton pantographs and duplicators—up to 10 x 20 ft. Write on company letterhead, giving name and full title, for Publication 2070-A to GEORGE GORTON MACHINE CO., 1209 Racine St., Racine, Wis.

The "Sevo" Swedish Vise is introduced to American industry in a newly published bulletin. This universal screw vise instantly clamps round, tapered or irregular objects. The bulletin contains complete details and can be had from the U.S. distributor, DE WILDE-JONES, INC., 181 Steuart St., San Francisco 5, Calif. **Inform-A-Gram No. B3.**

New Cincinnati Shear Catalog S-6h is off the press. This illustrated catalog gives a complete description of All-Steel Cincinnati Shears in capacities from 12 gauge to 1¼" steel plate, in 4-foot to 24-foot lengths. The Cincinnati Shaper Co. will honor all request from T&P readers. **Inform-A-Gram No. B4.**

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Hydraulic Cylinder Catalog. Rivett's new Catalog Section No. 105 illustrates and describes 108 different models of hydraulic cylinders, each in ten bore diameters. This three-color book lists every standard hydraulic cylinder offered in the industry. Working drawings and specifications are furnished for each model and size cylinder. All information relative to a particular model is shown on one page, facilitating easier layout of circuits by the engineer. Address requests to RIVETT LATHE & GRINDER, INC., Dept. T&P, Brighton 35, Boston, Mass.
Inform-A-Gram No. B5.

Hamilton Drills and Tappers can save time and money on accurate small-hole production, according to new Bulletin No. V-472. Descriptions of the "Varimatic" Drill, A-M Drill and Hamilton Tapper are contained in this publication. Each is a bench-type, super-sensitive machine with ample clearances and travel. The Hamilton Tool Co. is now mailing copies of this new bulletin.
Inform-A-Gram No. B6.

Artus Plastic Shims, gaskets and shim stock are featured in a new bulletin. Each thickness is a different color. The shims are made of durable plastic and retain thickness and evenness under all normal conditions. The bulletin has illustrations and a price list. INDUSTRIAL PRODUCTS SUPPLIERS, 201 S. Dean St., Englewood, N. J.
Inform-A-Gram No. B7.

The B&S Automatic Pinion Turning Machine dependably meets all close tolerances and fine-finish requirements of military and civilian assemblies such as clocks, instruments, fuses and timers. Detailed specifications and literature are offered by Brown & Sharpe Mfg. Co.
Inform-A-Gram No. B8.

Wessonmetal (Carbide) Solid Blades, standard and special tips, and solid shapes are described in a new bulletin from Wesson Metal Co. The firm makes six standard grades and two special grades to meet high speed and feed rates of modern machine tools.
Inform-A-Gram No. B9.

ARMSTRONG

Drop Forged

LATHE DOGS

ARMSTRONG Lathe Dogs give extra service because they are drop forged from selected open hearth steel, and, are heat treated to extreme toughness and stiffness. Hubs are made large enough to permit re-tapping, screws are also of special analysis steel and are hardened at the point to prevent upsetting. ARMSTRONG Dogs come in 10 types with square head or safety headless screws, with straight or bent tails. They are carried in stock by your local ARMSTRONG Distributor.

ARMSTRONG BROS. TOOL CO.

5220 West Armstrong Ave.
Chicago 30, Ill.
New York and San Francisco

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Challenge Surface Plate Equipment includes angle plates, box parallels, V-blocks, right angle irons and straight edges. Complete information and prices on this precision equipment can be obtained from The Challenge Machinery Co.
Inform-A-Gram No. B10.

Micro Supreme Layout and Identification Dye, for quick identification of bar stock, sheets, strips or parts, is made by Michigan Chrome & Chemical Co. Samples and descriptive literature are offered.
Inform-A-Gram No. B11.

A Detailed Data Book on all Hy-Ten Alloy Steels is offered by Wheelock, Lovejoy & Co., Inc., One of the steels described therein is Hy-Ten "M" Temper Alloy Steel, which has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost.
Inform-A-Gram No. B12.

The Nobur Tool eliminates hand methods, makes hole deburring a speedy machine operation. A pamphlet from Nobur Mfg. Co. gives full details.
Inform-A-Gram No. B13.

THE VERY BEST

DIE CUSHIONS

290 INSTALLATIONS
(There must be a reason)

For DEEP DRAWING
PAD CONTROL
KNOCK OUTS

Complete Die Cushion Engineering service at your disposal without obligation on all cushion applications.

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7, MINNESOTA

Spade Drills and Core Drills. Conner Tool & Cutter Company's illustrated, 52-page Catalog No. 51 shows both these drill types in stock sizes $1\frac{1}{64}$" to 5" dia., in steps of $\frac{1}{64}$", interchangeable in eight sizes of holders. Oil hole holders, for production drilling and for deeper holes, are also included. The catalog shows examples of special tooling designed for large and extremely deep hole drilling and boring. CONNER TOOL & CUTTER CO., 1000 E. McNichols Rd., Detroit 3, Mich.
Inform-A-Gram No. B14.

Twist Drill and Tap Grinders made by METEOR, Ltd., Zurich, Switzerland, are featured in catalog sheets (8¼" x 12") available from Carl Hirschmann Co. These precision machines are stocked and serviced by Hirschmann, recently appointed exclusive U. S. representative for METEOR. Address CARL HIRSCHMANN CO., 30 Park Ave., Manhasset, N. Y.
Inform-A-Gram No. B15.

EveredE Offset Boring Heads are the subject of new literature from the Chicago manufacturer. There are three sizes provided with split type bushings. These boring heads are applicable to turret lathes as well as jig borers and horizontal milling machines. EveredE Tool Co. will honor requests for literature.
Inform-A-Gram No. B16.

Dake Movable Frame Presses. Full details on these presses, designed for handling big, awkward parts, are given in newly-issued Bulletin No. 269. Write for your copy to DAKE ENGINE CO., Dept. T&P, Grand Haven, Mich.
Inform-A-Gram No. B17.

C-5 Cutting Compound for stainless and other alloy metals has been introduced by Felt Products Mfg. Co. It has been developed to prevent galling and pitting of metal surfaces, increase tool life, permit higher cutting speeds and assure greater accuracy through maintenance of uniform cutting temperatures. C-5 Cutting Compound is recommended for boring, turning, tapping, threading, broaching, grooving, sawing and other metalworking operations. A free test sample of the new compound and complete data sheets can be obtained by writing FELT PRODUCTS MFG. CO., 1504 Carroll Ave., Chicago 7, Ill.
Inform-A-Gram No. B18.

Sibley Model ME-25 Multiple Spindle Drilling Machines are introduced in Catalog No. 70. Their swing and variable speed drive are features previously found only on machines of greater weight and size. This publication also gives specifications and data on the Sibley Model MC-20. SIBLEY MACHINE & FOUNDRY CORP., 206 E. Tutt St., South Bend 23, Ind.
Inform-A-Gram No. B19.

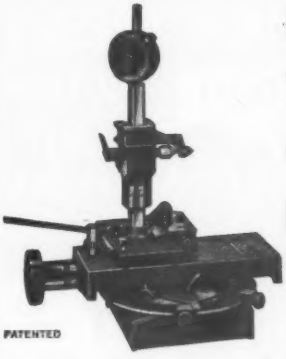
Bokum Boring Tools are now available in three cutting materials: super high speed steel, carbide-tipped and solid carbide. They come in a range of sizes to bore holes from $\frac{1}{16}$" dia. and up. Descriptive literature has been printed by the Detroit firm.
Inform-A-Gram No. B20.

New Possibilities afforded by contour grinding with continuous inspection are explored in a bulletin issued by The Cleveland Grinding Machine Co., manufacturers of the Visual-Grind machine. Typical applications are pictured.
Inform-A-Gram No. B21.

The Vernon Sheet Floater makes it possible to separate stacked steel sheets or blanks without difficulty — speedily and with minimum damage to gloves and minimum danger of cuts and lacerations to the worker's hands. It consists of powerful Alnico V magnets arranged to induce a magnetic field in the stacked sheets in such a manner that the sheet ends repel each other and fan out with air space between them. Descriptive literature and prices are available from Verson All steel Press Co.
Inform-A-Gram No. B22.

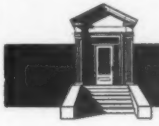
An Illustrated Folder on the "Comparitrol" Comparator is offered by George Scherr Co., Inc. Designed for quick checking of duplicate work visually, to .0001", this comparator has separate anvils and contact points to suit a variety of work.
Inform-A-Gram No. B23.

T-Nuts and Stud Sets, step block sets, punch press sets, jig feet, screws, hand knobs and many other tool specialties are described in the extensive catalog published by Northwestern Tool & Engineering Company.
Inform-A-Gram No. B24.



IT'S EASY ON YOU, AND YOUR GRINDING ROOM

The small, precision-built machine you see above is the Radi-Form, a grinder attachment, that does almost everything but talk. The Radi-Form can move the work in a predetermined arc of any desired radius, from 1/16″ to 2″ concave, from .00 to 2″ convex, which means that radii can now be generated even on carbide tipped cutting tools in a matter of minutes, to within .0005 accuracy on a standard, unformed, cupped diamond wheel. You save headaches, time, and gain increased production. Write for literature and prices that will surprise you.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Examples of Tooling the "Speed Vise" Way are pictured in a new pamphlet from Cardinal Machine Co. Outstanding features of the "Speed Vise" are listed, as are specifications and prices. CARDINAL MACHINE CO., Dept. T&P, Glendale, Calif.
Inform-A-Gram No. B25.

"Fascut" End Mills, a complete line that includes the popular three-fluted mill, are described in current literature prepared by Arrow Tool & Reamer Company.
Inform-A-Gram No. B26.

Monopak-Cartridges, for pneumatic and hydraulic cylinders, are the subject of six data sheets available from Hydraulic Accessories Co. Designed to provide a simple solution to problems of assembly and maintenance, they combine all the necessary packings, bearings and rod-wipers into one compact unit, which can be installed or replaced by totally inexperienced mechanics within a few seconds. HYDRAULIC ACCESSORIES CO., 439 E. Fort St., Detroit 26, Mich.
Inform-A-Gram No. B27.

A Giant Automatic Turret Lathe, Model 10-U, is described in a four-page folder from the manufacturer, Potter & Johnston Co. It is designed to handle big jobs and is equipped with a 75 hp multi V-belt drive, magnetic clutch and brake. There is a 49" dia. swing over base ways, a 36" dia. swing over cross slides for chucking and a 27" dia. swing over cross slides for machining. Detailed specifications and other facts are listed in the folder. POTTER & JOHNSTON CO., Dept. T&P, Pawtucket, R. I.
Inform-A-Gram No. B28.

The Light Duty "Autostop" Adjustable, Automatic Stock Feed Stop is featured in Dahlstrom's latest folder. The Autostop will work with blanking, progressive or compound dies. It will handle sheet steel $\frac{1}{16}$" x 6" or equivalent and can be mounted on the stripper plate in as little as 15 minutes. DAHLSTROM MFG CO., 2508 W Larpenteur Ave., St. Paul 8, Minn.
Inform-A-Gram No. B29.

The Burgess Vibro-Graver writes like a pencil on steel, lead, glass, wood and other hard surfaces. This new, speedy, permanent marking tool engraves numbers or names on tools, jigs, dies, gears, finished parts. Detailed literature can be obtained from Burgess Vibrocrafters, Inc.
Inform-A-Gram No. B30.

Pluto Swiss Needle Files and Danish-made twist drills are described in a catalog sheet obtainable from Pluto Tool Co. Complete prices and sizes are listed for these quality tools. PLUTO TOOL CO., 156 Chambers St., New York 2, N. Y.
Inform-A-Gram No. B31.

New Selective Numbering Heads. Model 83, for stamping operations requiring quick selective numbering, are annouced by Numberall. Wheels are engraved with direct sight features at front of machine, set to the required character by turning the knobs. By pushing the knobs right or left, any one of the wheels may be engaged. The indexed wheel selector knob serves as a positive stop for every wheel. Write to NUMBERALL STAMP & TOOL CO., Huguenot Park, Staten Island 12, N. Y., for detailed Bulletin 83-56.
Inform-A-Gram No. B32.

"Molykote Lubricants for Industrial Applications" is an eight-page bulletin of case histories describing the successful use of Molykote in various applications including machine tools, dies, press fittings, taps, cold forming, etc. This informative bulletin, No. 93, can be procured from the manufacturer, THE ALPHA CORP., 179 Hamilton Ave., Greenwich, Conn.
Inform-A-Gram No. B33.

Whistler Magnetic Dies provide a fast method for perforating sheet metal. Hole centers may be held to .0005" accuracy or as close as can be jig bored. The Whistler Magnetic Perforating Catalog contains several case histories illustrating the cost-cutting advantages of these dies.
Inform-A-Gram No. B34.

All the Facts on the Emco Power Punch Press are given in an attractive bulletin released by the manufacturer, Klaas Machine & Mfg. Co. The Emco Press performs up to 18,000 operations per hour, is available in 5 and 10 ton models.
Inform-A-Gram No. B35.

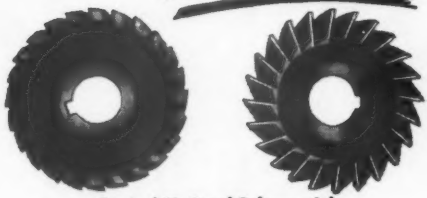
The Low-Cost Benchmaster Milling Machine is presented in a current brochure. This five-in-one machine tool performs the following operations: vertical milling; horizontal milling; drilling; grinding; and turning. Illustrations of the Benchmaster Miller set up for these jobs are included in the brochure, along with specifications and descriptions of available attachments. BENCHMASTER MFG. CO., 2952 W. Pico Blvd., Los Angeles 6, Calif.
Inform-A-Gram No. B36.

The Vulcanaire Jig Grinding Attachment permits finish grinding of holes in hardened steel to "tenths" at speeds of from 30,000 to 65,000 rpm. A manual of photos showing operations the Vulcanaire performs is obtainable from Vulcan Tool Co.
Inform-A-Gram No. B37.

Current Catalog No. 51, a 24-page booklet, illustrates and describes the Johnson Gas Appliance line of furnaces, burners, valves, torches, mixers and blowers.
Inform-A-Gram No. B38.

WORN and OBSOLETE CUTTERS RECLAIMED

at low cost



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High Speed and Carbide Service

Let us show you how your cutting tool costs can be reduced by an organized salvaging program. We also manufacture carbide tipped drills for producing holes and centers in hardened steel (up to 66-C).

Representatives in all industrial areas.

National TOOL SALVAGE CO.

6511 Epworth Detroit 10, Mich.

Precision Screws and Supplies for scientific instrumentation are presented in a catalog being distributed by The R. Y. Ferner Co., Inc. Complete prices, sizes, tolerance data and ordering information are listed. Address THE R. Y. FERNER CO., INC., 110 Pleasant St., Malden 48, Mass.
Inform-A-Gram No. B39.

Roll Forming Machines and Roller Dies are standouts in the Maplewood Machinery Co. line. The company can supply full details and literature.
Inform-A-Gram No. B40.

A Fully Diagrammed Catalog, bound in a durable, two-color cover, has been issued by Ortman-Miller. This 28-page book covers O-M Air, Hydraulic and Water Cylinders, giving complete engineering specifications and data on O-M's special internal locking system, and a full listing of parts. The data shown cover standard, oversize and 2-1 piston rods. Write ORTMAN-MILLER MACHINE CO., INC., 1200 150th St., Hammond, Ind., and ask for Bulletin No. 101.
Inform-A-Gram No. B41.

Commercial Ultrasonic Testing Services of metals and other materials in the field and at its testing laboratory are described by Sperry Products, Inc., in new Bulletin 50-115. Testing with Reflectoscope and Reflectogage is offered industrial concerns that have occasional need for ultrasonic and non-destructive testing, but whose needs do not warrant purchasing an instrument or training an operator. Write for this bulletin and further details to W. C. Minton, Service Supervisor, SPERRY PRODUCTS, INC., Dept. T&P, Danbury, Conn.
Inform-A-Gram No. B42.

The Moore Panto-Crush Wheel Dresser speeds form-grinding. Both crush-forming and diamond dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. Switching from one method to the other can be done without disturbing the workpiece setting. Moore Special Tool Co., Inc., offers a fully descriptive brochure.
Inform-A-Gram No. B43.

The New, Improved Nu-Matic Grinder is presented in an illustrated circular just published. This grinding unit features a pneumatic drum. Specifications, prices and complete details are given in the circular. Write NU-MATIC GRINDERS, INC., 8225 Carnegie Ave., Cleveland 3, Ohio, and ask for Form No. 14511.
Inform-A-Gram No. B44.

Wells No. 8 Metal Cutting Band Saw is featured in new literature. It has an 8" x 16" capacity for rectangular pieces and an 8" dia. capacity for rounds. It is applicable for production or general utility cut-off jobs, or both.
Inform-A-Gram No. B-45.

Low Hydrogen Electrode Stabilizer. Fred C. Archer, Inc., has introduced a compact, efficient, moisture-content stabilizer that provides the desired protection of low hydrogen welding rods at point of use. The Blueweld "Lo-Hydrogen" Electrode Stabilizer stores 4000 lbs. of electrodes and, because of its size and compact design, may be located at any point convenient to the welding operation. FRED C. ARCHER, INC., 606 W. Wisconsin Ave., Milwaukee 3, Wis., will provide descriptive literature.
Inform-A-Gram No. B46.

Littell Air Blast Valves are presented in a new catalog. These valves eject automatically by air, keeping hands and fingers away from the press ram. In addition to their safety value, they permit faster production and lower labor costs. A copy of the Air Blast Valve Catalog can be obtained from F. J. Littell Machine Company's Air Division.
Inform-A-Gram No. B47.

Moore Pneumatic Comparator Gages are painstakingly described as to basic operating principle, various models, applications and advantages in colorful Bulletin 8004. For your copy of this well illustrated, 24-page publication, address MOORE PRODUCTS CO., H & Lycoming Sts., Philadelphia 24, Pa.
Inform-A-Gram No. B48.

All Lamina Dies are equipped with the Lamina patented guide pin bushing, which combines hardened steel for long wear with bronze plating for free running qualities. The complete story of Lamina's products and services is told in the company's illustrated catalog.
Inform-A-Gram No. B49.

Kutmore Adjustable Hollow Mills are the subject of Catalog No. 20, prepared by Carl Wirth & Son, Inc. These mills have an exclusive micrometer adjustment feature for rapid setup. Cutting capacities from 1/32" to 2" diameter are available from stock.
Inform-A-Gram No. B50.

Long-Lasting Cutters and Collets are made by H. P. Preis Engraving Machine Co. The firm will send data on a wide range of styles, types and sizes.
Inform-A-Gram No. B51.

Wittek Roll Feeds, made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes, are shown in a current brochure. This publication also contains a description of Wittek Adjustable Reel Stands.
Inform-A-Gram No. B52.

Dykem Steel Blue increases efficiency and accuracy in the making of dies and templates. Full information can be had from the manufacturer.
Inform-A-Gram No. B53.

LOWEST COST PRECISION
FOR TOOL ROOM AND PRODUCTION
ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!
Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. ¾ HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters. PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.
Write FOR CATALOG
PRECISE PRODUCTS CO., 1341 Clark St., Racine, Wis.
PRECISE GRINDER-MILLERS

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

"File Philosophy" is an informative, 48-page, Nicholson booklet that contains a section on "the right file for the job," a short historical account of the development of the file, and useful hints on caring for files.
Inform-A-Gram No. B54.

Surface Hardness of Woodworth "Nawlide" Gages is equivalent to that of tungsten carbide gages. Cost per gage is much less. Complete details are procurable from N. A. Woodworth Co.
Inform-A-Gram No. B55.

52100 Steel Tubing and Bars, made by Peterson Steels, Inc., give you high hardness, yet are easily machined. A complete stock list published by the manufacturer contains full information on all available sizes, finishes, etc.
Inform-A-Gram No. B56.

Crystal Lake Cylindrical Grinders hold close tolerances and guarantee quality work, according to a catalog from the manufacturer. No. 750 Plain Cylindrical Grinder is a standout in this line.
Inform-A-Gram No. B57.

PLASTIC . . . MAGNESIUM . . . FIBRE
MONEL METAL . . . HARD RUBBER
. . . other rigid non-magnetic materials
CAN BE HELD ON MAGNETIC CHUCKS!
*Patented
Magna-Vise* MAKES IT SIMPLE!
Get full details on this revolutionary shop-proved device . . . write Dept. TJ-121
Hanchett MAGNA-LOCK CORPORATION
Magna-Lock
Magnetic Chucks and Devices
BIG RAPIDS • MICHIGAN, U. S. A.

A Colorful New Brochure fully describes the Lectroetch Electrolytic Stencil Etching Process. By this process, parts receive a distinctive mark that will not rub, dissolve or peel off. Dimensions are not affected; there are no burrs or deformation of thin sections. The new brochure contains many illustrations and a complete description of the process and its component parts. THE LECTRO-ETCH CO., 14925 Elderwood Ave., E. Cleveland 12, Ohio.
Inform-A-Gram No. B58.

Hanna Unitite Valves are hand-operated valves that incorporate the latest design and construction features to give maintenance-free operation for 10 to 15 million or more cycles. Complete details are included in Hanna Valve Catalog 254, available from HANNA ENGINEERING WORKS, 1765 Elston Ave., Chicago 22, Ill.
Inform-A-Gram No. B59.

Sundstrand's Straight-Line Action Air Sanders are covered in literature just issued. Because of this straight-line action, the sander removes scratches and defects, leaves no swirls or pressure marks. Write for literature and price information to SUNDSTRAND MACHINE TOOL CO., Pneumatic Div., Dept. T&P, Rockford, Ill.
Inform-A-Gram No. B60.

"Machine Shop Time Savers by J & S" is an illustrated booklet describing cutting tools, "Down-Hold" Vise Jaws and "Attachable" Parallels, "All-Purpose" Jaw Clamps, and the J & S Form Grinding Service. J & S Tool Co., Inc., is now mailing copies to interested persons.
Inform-A-Gram No. B61.

The Taylor & Fenn M-80 Duplex Spline Milling Machine with 4" stroke is now being made by The H. P. Townsend Mfg. Co. It uses cutters of small diameters for efficiently and accurately cutting splines or keyways, and for various other types of work. Specifications, details of construction and illustrations of typical production samples are to be found in a circular offered by THE TOWNSEND MFG. CO., Dept. T&P, Elmwood, Conn.
Inform-A-Gram No. B62.

Merkert Marking Dies are described in a current, 20-page catalog. Illustrations and price information are included on brass stamps, burning brands, engraved dials, various types of dies, knurls, letters and figures, engraved molds, steel stamps, etc. Available type styles are shown. MERKERT AND SONS, 146-10 Jamaica Ave., Jamaica 2, N. Y.
Inform-A-Gram No. B63.

"Camming for H&G Self-Opening Die Heads on Automatic Screw Machines" is the feature article in The Eastern Machine Screw Corporation's publication, "Die Headlines." This informative article is highly illustrated. THE EASTERN MACHINE SCREW CORP., Truman & Barclay Sts. New Haven 6, Conn.
Inform-A-Gram No. B64.

Hardinge-Sjogren Chucks and Collets are presented in Bulletin 8. Advantages pointed out in the literature include: complete capacity for hexagon and square as well as round; low initial cost; long service life; and grips both short and long lengths properly. Copies can be had from Hardinge Brothers, Inc.
Inform-A-Gram No. B65.

"Burr-Master" Gear Burring and Chamfering Machines are featured in a new folder from Modern Industrial Engineering Co. Examples are shown of their efficient use in automotive, aircraft, tractor and marine gear manufacturing.
Inform-A-Gram No. B66.

Carboloy Die Engineering Manual D-124 includes many valuable data on carbide dies; covers their design, manufacture and application in its 36 illustrated pages.
Inform-A-Gram No. B67.

Acro Pin Oilers are designed to stop wear on die sets. Acro Metal Stamping Company's bulletin TD-30 gives the complete story of how these pin oilers eliminate bushing wear and leader pin scoring, and maintain die accuracy.
Inform-A-Gram No. B68.

The Latest, 42-Page Catalog (No. 103) of Whitman & Barnes pictures the complete workings and components of the Hercules Interchangeable Punch System.
Inform-A-Gram No. B69.

NEW MACHINE LEVELING DEVICE
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Where anchor bolts are used, this new Empco Jack Style JS will save considerable time in setting and keeping equipment level.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Grobet Chatterless Countersinks have six staggered cutting edges to give a shearing cut that eliminates all chatter. Detailed Catalog AC1 is procurable from Grobet File Co. of America, Inc.
Inform-A-Gram No. B70.

"Friction Sawing", is an informative publication of The Tannewitz Works. It enumerates the time- and money-saving advantages of friction sawing with Tannewitz High Speed Band Saws.
Inform-A-Gram No. B71.

The Full Line of Armstrong Tool Holders and other products, including C-clamps, machine dogs, wrenches, etc., is presented in a comprehensive catalog compiled by Armstrong Bros. Tool Co.
Inform-A-Gram No. B72.

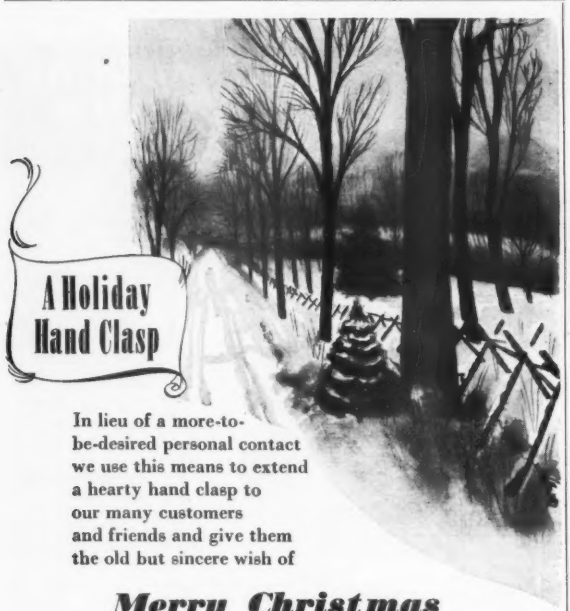
Rousselle Punch Presses, for high speed production with low annual maintenance, are described in new literature being sent out by the builder of this line, Service Machine Company of Chicago.
Inform-A-Gram No. B73.

DCMT Model IMP-96 One Pound Die Casting Machine is fully described as to price and construction features in newly published literature. This machine has a pilot-operated impact type injection cylinder with slide valve in head, controlled by a finger-light trip lever and employing a safety interlock valve to prevent metal injection before the dies are fully closed. DCMT SALES CORP., Dept. T&P, 164 Duane St., New York 13, N. Y.
Inform-A-Gram No. B74.

The Koch Test Indicator, described in a new pamphlet, has two worked ends—one end to test outside surfaces, the other inside. The plunger moves away from, instead of against, the lever, preventing the delicate parts from being broken by a sudden or excessive jolt of the plunger. Photos and a full description are contained in the literature. ANDREW GENALES, 22 Second Ave., Nyack, N. Y.
Inform-A-Gram No. B75.

Precision Jewelers Lathes are the subject of Catalog E, released by Louis Levin & Son Inc. In addition to describing these lathes for fine instrument work and second operations, the catalog illustrates and describes a full line of accessories including: compound slide rests; grinding, milling and screw cutting attachments; cross slide; and collet closer.
Inform-A-Gram No. B76.

Chaso-Royco Tool Co., Inc., serves as a single source of both taps and chasers, assuring uniformity and precision between the two. All tangent type chaser threads are ground from the solid. A descriptive catalog is being mailed.
Inform-A-Gram No. B77.



In lieu of a more-to-be-desired personal contact we use this means to extend a hearty hand clasp to our many customers and friends and give them the old but sincere wish of

Merry Christmas
and a
Happy New Year

THE WELDON TOOL COMPANY
3000 Woodhill Road, Cleveland 4, Ohio.

M-109 Automatic Forming Machines, formerly made by Taylor & Fenn, are now manufactured by The H. P. Townsend Mfg. Co. These small machines (only 24" long x 10" high) are capable of maintaining high rates or production and accuracy on small precision parts. An illustrated, descriptive circular can be had from THE H. P. TOWNSEND MFG. CO., Dept. T&P, Elmwood, Conn.
Inform-A-Gram No. B78.

Standard's Precision Grinding Attachment makes double-purpose machines out of your planers, boring mills and shapers. Catalog 44, obtainable from The Standard Electrical Tool Co., includes details on three sizes.
Inform-A-Gram No. B79.

"De-Sta-Co" Toggle Clamps are made in more than 40 models to solve any problem in production work-holding. The current Detroit Stamping Co. catalog contains descriptions of the whole line.
Inform-A-Gram No. B80.

Horberg Drill Size, Pin Gages are described in detail in new literature. They provide unlimited time- and cost-saving advantages in center and location finding, hole or slot gaging.
Inform-A-Gram No. B81.

All Universal Drill Bushings are tested for hardness to assure longer bushing life. A complete and illustrated drill bushing catalog can be had from Universal Engineering Co.
Inform-A-Gram No. B82.

Etalon Calipers. Alina Corporation offers a new, 16-page catalog covering a complete line of precision calipers, micrometers and dial micrometers.
Inform-A-Gram No. B83.

Marshall Precision Ground Flat Stock, available in a large range of sizes in three grades, is the subject of a current catalog. Prices and sizes are given for WATERcrat, OILcrat and AIRcrat tool steels.
Inform-A-Gram No. B84.

Punches, Shears, foot and power presses, bending brakes, etc., are presented in Whitney Metal Tool Company's latest, illustrated catalog. It is designated No. 16-50.
Inform-A-Gram No. B85.

Hovis Universal Washer Dies provide a master holder and by merely changing five small, easily removable parts the new washer or blank is produced. Hovis Screwlock Corp. will honor requests for literature.
Inform-A-Gram No. B86.

Ingersoll Replacement Cutter Blades, described in the Rockford (Ill.) company's latest tool catalog, are available in high speed steel, carbide-tipped and cast alloy.
Inform-A-Gram No. B87.

PEMACO HYDRAULIC AND AIR CYLINDERS
with the NEW
Cartridge Type Packing Gland

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Pemaco Hydraulic Cylinders are soundly engineered—give long life and top performance. The steel ram is hardened to 50.C Rockwell, ground and lapped. NOW the Pemaco has the first self-contained Cartridge Type Packing Gland.

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Pemaco "EASY-PAK" Cartridge Type Packing Glands are manufactured for both hydraulic and air cylinders.

PETCH MANUFACTURING COMPANY

Write for complete information and engineering data.

36100 HARPER AVE.
MT. CLEMENS, MICH.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Die Casting Die, from page 118

First, the outer edges of overflows must be a minimum of 2½ inches from the edges of dies to be employed in the production of zinc die castings and 3 inches from the edges of dies to be used to cast aluminum, magnesium, and brass. These minimums are found necessary to prevent the molten alloy from spitting dangerously out of the die during the injection phase of the casting cycle. For this reason it is best not to design a die with its main die cavity so close to the edge of the die block that it does not leave enough room for the subsequent addition of overflows between the edge of the main die cavity and the edge of the die blocks.

Second, the die designer must remember that every time he adds an overflow, he increases the force tending to cause the die halves to open during the injection phase of the casting cycle. The greater the projected area of the overflows onto the plane of the die parting, the greater this force will be. It is wise to bear this in mind when designing a die whose projected main die cavity area is by itself close to the maximum permissible projected area, for in cases like this, the addition of overflows may be neither wise or practical.

Porosity and Overflows

When porosity persists in reoccurring in the same part of a pressure die casting after all other avenues of correction have been attempted, overflows may be resorted to; however, it must be remembered that overflows may also fail to eliminate the porous area.

To ascertain the location of porous areas in a die casting, the die casting engineer may either fluoroscope the die casting or take an X-ray photograph of it. Once porous areas are revealed, steps can be taken to eliminate them, i.e., overflows can be placed where they will do the most good.

Disadvantages in the Use of Overflows

While it is difficult to generalize on the disadvantages attendant to the use of overflows, it is easy to point out certain disadvantages in specific instances:

Take, first, the case where the die casting to be made must ultimately be polished or plated all over; here the overflow feed marks left on the surface of the die casting after the overflow is sheared off in the trimming die must be polished out at extra expense.

Second, take the case where the mass of the overflows exceeds, or is near, the mass of the casting itself; here the die caster has to continually melt and remelt the overflows while producing castings, hence the metal loss per unit weight of castings is high compared to that loss where he is producing the same part without overflows.

Third, the presence of overflows on a die casting as it comes out of the die makes handling the part difficult. If the overflows break off they must be gathered up and remelted, all of which takes time. If they do not break off before the casting reaches the trimming die, they must be broken off by hand, provided this is possible, or else the trimming die must be so constructed as to trim them off. The latter often necessitates the use of a larger and more expensive trimming die.

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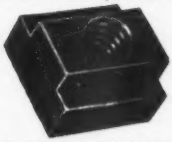

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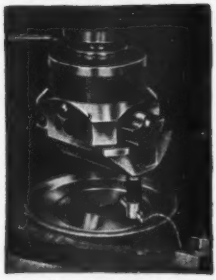

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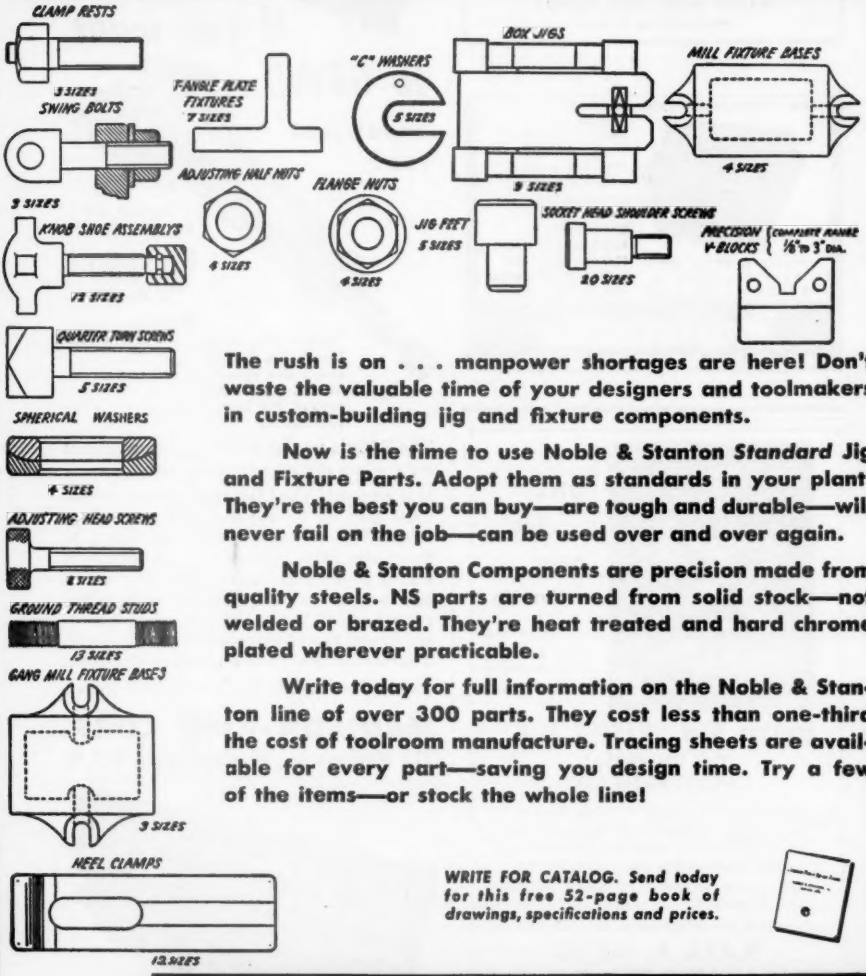

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INFORM-A-GRAM KEY NUMBERS

1952 Tool Show to Stress Increased Productivity

The 1952 A.S.T.E. Industrial Exposition, to be held in Chicago, March 17-21st, under the sponsorship of the American Society of Tool Engineers, will feature production equipment (both domestic and foreign) designed to provide a sound American economy during our current war-peace mobilization program.

The urgent need for such equipment is pointed out by A.S.T.E. President J. J. Demuth, who states:

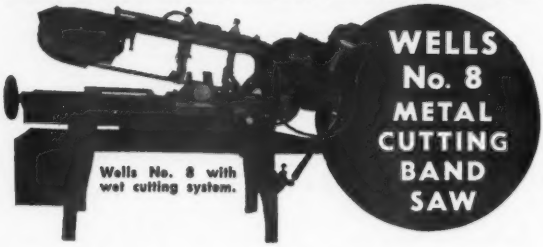
"With American and Canadian industry expanding to meet the needs of our mobilization program, increased productivity is a paramount objective. One big bottleneck that is slowing our defense program is the delivery of necessary production equipment. This bottleneck can be overcome by doing three things: (1) Making our existing equipment do more work by applying more productive tooling, controls and devices; thus making more of our productive facilities available for stepping up defense schedules; (2) making sure that such new equipment as is required is designed to give maximum productivity; and (3) utilizing those processes and techniques in each case which will give the maximum output with minimum of basic equipment.

". . . . We hope that the 1952 Industrial Exposition . . . . will show us some new ways to improve our productivity—new machines, new machine accessories, new tools, inspection devices, materials handling, and other plant equipment, and processes."

Five feature days have been planned at the Exposition which tie in with the technical program of the 20th Annual A.S.T.E. Meeting that will be held simultaneously. These five days, and the interests they will cover, are:

1. INSPECTION AND QUALITY CONTROL DAY. This will include exhibits and technical papers relating to new gages, indicattors, comparators, measuring blocks, instruments, inspection and testing equipment, setup

On cut-off jobs . . . *This is the saw that* SAVES TIME . . . MONEY . . . MANPOWER



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tools, optical apparatus, etc.

2. METAL CUTTING DAY. This will cover new machine tools and attachments, cutting materials, tools, tool holders, lubricants and lubrication equipment.

3. MATERIALS FORMING DAY. Here new stamping, forging, plastics molding and other materials forming equipment will be featured in addition to dies, die sets and feeding and reeling devices.

4. GRINDING AND FINISHING DAY. This will cover interests in grinding, lapping, buffing, polishing and blasting equipment. Abrasive wheels, bands, strips, sticks, powders and pastes, plating supplies and marking equipment will also be shown.

5. MACHINE ACCESSORIES, DRIVES AND CONTROLS DAY. Here new chucks, collets, arbors, shafts, cams, gears, springs, fasteners and fixture components will be dealt with. Also new elements for mechanical, pneumatic, hydraulic, electrical and electronic machine drives and controls will be featured.

Applications for exhibit space are already rapidly approaching the total number of exhibitors at the 1950 Exposition. The 1952 Exposition, although providing 30% more floor space than any previous Tool Show, was already two-thirds "sold out" before November 1st—4½ months in advance of the show, according to H. E. Conrad, Executive Secretary of the Society.

Next year's show will have an exhibit floor space of 100,000 square feet with an estimated attendance of approximately 80,000 persons.

Activities during the Expostion are in the hands of an Exposition Committee chosen from the membership of the A.S.T.E. Chicago host Chapter number 5. This committee is completing final arrangements to make a smooth running program of social and technical events.

Full details regarding exhibition space, hotel reservations or advance registrations can be had by writing H. E. Conrad, Executive Secretary, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

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as well as I do, and I am not going to rehearse them here. I do, however, want to pay tribute to the men in our industry who have worked so long and so patiently with the people in Government, so that at long last Government recognized the urgency of the situation and took steps which are now permitting us to go ahead. Let me give you just one example by way of illustration.

The solution of our price problem was due primarily to the services of a Task Group of the Machine Tool Advisory Committee, which was specially set up for this purpose. This Task Group met in Washington eleven times before the problem was finally solved—and on every one of those occasions there was a full meeting of the Committee.

I wish also to express to member companies and customer companies who have released men to serve in Washington in the Metal-Working Equipment Division of The National Production Authority, and to those men themselves, the appreciation and gratitude of our entire industry. Their help in this emergency is of inestimable value to our country.

Mr. Hollengreen, in his report, will tell you the current status of our relations with Government, and I will leave that subject to him. What I want to emphasize is just this—

For a long time it was very difficult for us to move forward, because Government did not seem to understand the picture. Now all that has changed. Today Government is fully aware of the part we play in the emergency, and has promised us wholehearted cooperation. We may not agree with some of the methods and procedures suggested. There will be delays and difficulties as to the interpretation of directives. The road will not be smooth, by any means. But the important thing is that our Government and our industry are now pulling the same way; and whatever the stumbling blocks, whatever the handicaps, it is up to us to pull just as hard as we can.

We have the green light. Well—let's go. If war should break out six months from now, and we had not expanded production

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during that period any more rapidly than we have during the last two months, how would our record look to the American public? And what shape would we be in to take the impact of the load that would be dumped upon us then?

This is no theoretical danger that is confronting us. There is real danger of war. The faster we can build up our metal-cutting potential, the less the danger. But if war should be inevitable, there is all the more need for haste.

We must view this picture not merely as businessmen but as citizens in whose hands lies, by the nature of our business, the key to the defense of our country. We cannot sit back and say, "Well, we will step up output just as fast as it is comfortable and convenient to do so." We cannot choose a longer and slower method because it would be less bothersome and perhaps more profitable than a quicker method. We cannot look at this problem purely as a matter of business. This is a matter of the welfare and the defense of our country.

So I think the issue today boils down to this—what is the best method of speeding up the production of machine tools? I have some definite ideas on that subject which I want to lay before you for whatever they are worth.

There are only three ways of expanding machine tool output.

The first is that of making maximum utilization of our present facilities. This means hiring more people, going to multiple shifts, etc. We will do this, as much as we can and as fast as we can. But we can only get a fraction of the job done in that way. Our total plant capacity isn't what it was in World War II. We can start learner programs, training absolutely inexperienced people—but there again the time factor enters into the picture. It takes too long to turn a green hand into a productive worker.

The second method is plant expansion. Some companies have plant additions already under way, and that's fine. But starting from scratch today to build additional plants is going to take too much

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time. Besides, this takes steel. How soon could we get the steel? And there always remains in such cases the problem of what to do with the plant addition after the emergency is over.

The third method is subcontracting—and I think this is the most practical method of getting results in the shortest period of time, and has very distinct advantages, as follows:

1. Subcontracting utilizes manpower where it is now employed. Men don't have to leave one company and go to work for another in a different place.

2. Subcontracting eliminates the need for building new plants.

3. Subcontracting costs are allowed for in the machine tool price formula.

4. Subcontracting is the fastest method of increasing total volume of output.

5. Subcontracting employs management and engineering groups already in existence and keeps them intact for post-emergency production of their regular products.

The opportunity for placing subcontracts with companies equipped to do the work will, I think, in the near future be much greater than is now apparent.

Production is just beginning to get under way with a great many of the country's big prime contracts. As more and more of these projects get rolling, the amount of steel remaining for peacetime production will be less and less. Consequently, more and more plants will shortly be looking for something to do. They have been trying desperately in past months to keep up their steel inventories, but material on hand cannot last much longer.

Let me visualize an example of what I'm talking about. Let's assume that your plant is already operating at capacity and you have to double production. Why should you face all the problems involved in plant expansion and training an entire additional force of new, unskilled people when, let us say, a hundred miles away you have a customer whom you know has the equipment to make machine tool parts and whose plant is about to be shut down for lack of materials? Why build a new plant and a larger organization, when there is already a

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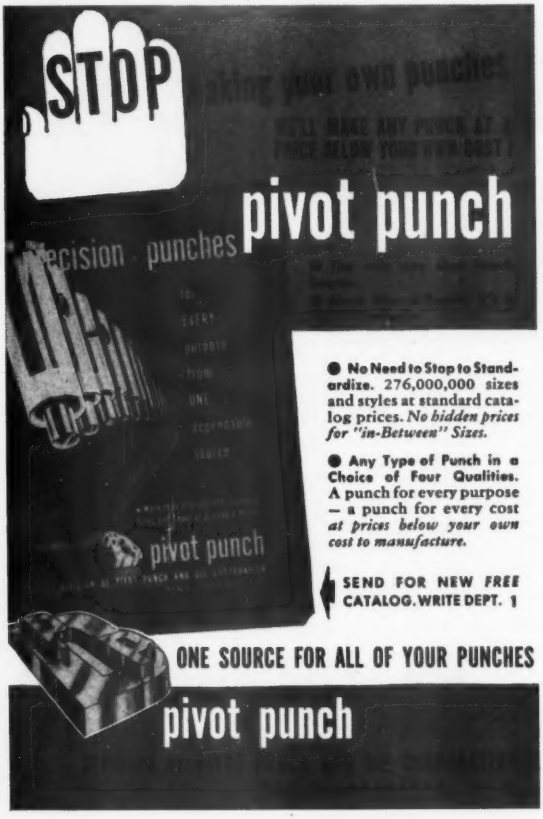
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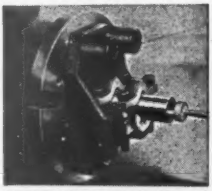

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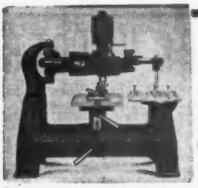

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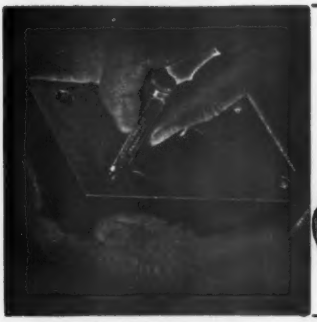

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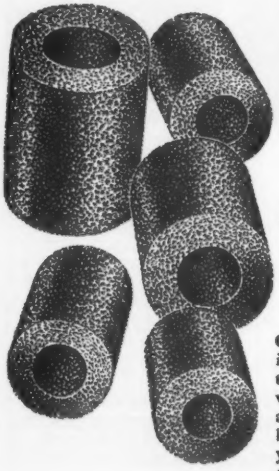

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DPA Chief to Address Plant Maintenance Conference

Manly Fleischmann, administrator, Defense Production Administration, will head a group of 56 speakers in the most extensive discussion of plant maintenance ever undertaken, to be held at the Plant Maintenance Conference, Convention Hall, Philadelphia, January 14-17, 1952. Mr. Fleischmann's subject will be "Plant Maintenance in National Defense."

The conference, which will be held in conjunction with the Plant Maintenance Show, will have as its general chairman L. C. Morrow, consulting editor, "Factory Management & Maintenance." More than 14,000 persons are expected to attend and 225 companies are planning to exhibit.

The displays also will be of record proportions in the field and will cover an area five times that of the first show held two years ago in Cleveland. Special emphasis in both the conference and the exhibits will be placed on preventive maintenance to help meet the huge military and civilian production schedules of next year.

The conference is sponsored by the American Society of Mechanical Engineers and the Society for the Advancement of Management. The American Society of Lubrication Engineers conducts the panel on lubrication.

Highlight of the conference will be the division into more than 30 separate sessions to accommodate special talks on individual industry needs and to permit executives to discuss problems that arise in plants of various sizes and varying maintenance needs.

General sessions will be on maintenance costs, project preparation, inspection methods, scheduling of maintenance work, training workers and supervisors, personnel, welding, etc.

Advance registration cards can be obtained from the exposition management, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

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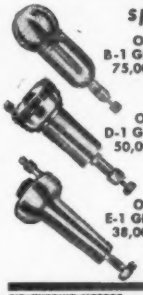

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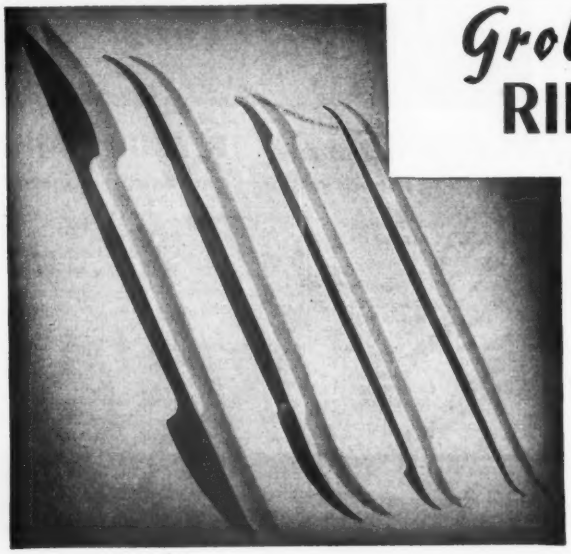

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Stainless Steel Research Is Intensified

Further intensification of metallurgical research in the specialty and stainless steel fields on the part of steel companies themselves and company-sponsored laboratories in colleges and universities has been reported by the Committee of Stainless Steel Producers of the American Iron and Steel Institute.

Purpose of the intensified research, the committee pointed out, is two-fold: (1) to make available for essential defense purposes as much stainless and high alloy steel as possible; and (2) to assure supplies of stainless steel for worthwhile civilian purposes. Of the primary alloying elements used in the production of these steels three—chromium, nickel and columbium—are imported.

Properties, such as resistance to temperature extremes and resistance to corrosion which these alloying elements give to stainless steels, make them essential components. These elements permit such steels to withstand unusual torture and treatment.

While production capacity for such steels is being pushed to the limit, research engineers are seeking solutions to metallurgical problems arising from high - temperature applications, such as those in jet engines, and from extreme corrosive conditions. At the same time, research men are working to develop stainless and other high alloy steels employing fewer alloy materials than those now commonly used, yet possessed of equal or even better serviceability and fabrication qualities.

HERBERT M. PIKER, president of Hamilton Metal Products Co., Hamilton, Ohio, has been elected to membership in the Young President's Organization, according to an announcement by Ray Hickok, club president.

The objective of the organization is to safeguard the incentive for individual initiative. To be elected to membership, a person must be less than 39 years old and be president of a company selling more than a million dollars worth of merchandise annually.

Mr. Piker became president of Hamilton in 1946 at the age of 32.

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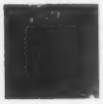

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E. W. BLISS COMPANY, Canton, Ohio, has announced the appointment of Iowa Machinery and Supply Company, Des Moines, as sales representative for Bliss mechanical and hydraulic presses for the central portion of Iowa. Representation will include Bliss inclinable, straight-side, enclosed, toggle and many other types of mechanical presses, as well as single- and double-action hydraulic presses, and container-making machinery. Repair and service functions for all Bliss machinery will also be handled by Iowa Machinery and Supply Co.

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Solving the Industrial Fatigue Problem

Fatigue, a major problem for industry, can generally be traced to the employee's attitude. A partial solution to the industrial fatigue problem and its harmful effects on production and accidents was offered by John W. Grimaldi, director, Industrial Division, Association of Casualty and Surety Companies, New York, at the 72nd Annual Meeting of the American Society of Mechanical Engineers in Atlantic City, N. J., last month.

He recommended an engineering and educational program that will reduce the strains of industrial work and will have a beneficial effect of the employee's attitude and physical condition.

"Manpower is the most expensive single factor in production costs. Yet most industrial plants know relatively little and often do practically nothing about using their personnel efficiently," Mr. Grinaldi stated. "Industry should know the significance, with respect to optimum production, of the definite personnel qualities such as physical condition, attitude and personality; and the variable qualities such as fatigability and susceptibility to depression, emotional upset, and process conditions and materials."

The fatigue encountered in most of modern industry is not that caused by hard physical exertion, he pointed out. "It encompasses that condition of weariness that one may experience at one instant and which, through some psychological stimulation or motivation, can quickly change to a feeling of alertness and vitality," he said. We may say that fatigue is partially related to motivation. This possibility requires that industry look to methods for stimulating employees' interest as a means for eliminating the harmful effects of fatigue."

Surveys made during the first extensive employment of women in industry showed that women are much more susceptible to fatigue than men.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Defense, from page 142

plant and an organization available for the work?

I think every machine tool company today should go prospecting for subcontractors. The place to start, I think, is among your own customers, where you know the people and know what kind of equipment they have. For all you know, a company that can do your kind of work, but is currently in full production on its own product, may know full well that two or three months from now it will be cut down on steel and will have idle capacity available. So snap up that capacity before somebody else gets it. Don't wait for possible subcontractors to come knocking on your door—for by that time, the very companies you want may already have turned to something else.

And don't get the idea that subcontracting in this period will give subcontractors the notion that they want to stay permanently in the machine tool business. All the subcontractors I have talked to wonder how we can possibly sell machine tools at the prices we do, and make a profit. Giving a company a subcontract would be the surest way to persuade that company that it could not compete with regular machine tool builders when the emergency is over. And if you will stop to think about it—do you know of any subcontractor during the last war who remained in the machine tool business after the war was over?

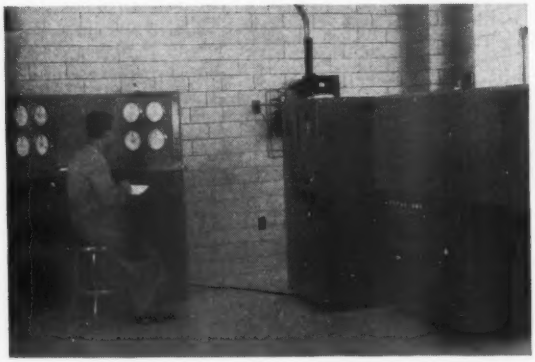
I don't think there is anything to worry about on that score. But if we don't get busy and line up subcontractors, we will not be in a position to complain if the Government arbitrarily decides that some industry, like the automobile industry, is going to build machine tools.

In conclusion, may I emphasize that we, and we alone, have a full understanding of the job that lies before us. The newspapers may report that the problem is well on its way to solution. Washington may issue statements that the machine tool crisis has been averted. But, gentlemen, newspaper stories and Washington bulletins build no machine tools. Only we can do that. Only by spreading our skills, our technical knowledge and our directive abilities over a broad enough field of performance, within a brief enough period of time, can the goal be reached. It is up to us.

★ ★ ★ ★ ★

New Chemical Laboratory Has Latest Equipment

Shown below is an interior view of the new Chemical Laboratory now in use at Vanadium-Alloys Steel Company. The Direct Reading Spectrometer pictured is the laboratory's outstanding feature. It is an electronically controlled spectroscope that determines the analysis of steel by measuring the light waves emitted by various chemicals. An accurate quantitative analysis of eight elements can be determined in one and one-half minutes.



The new building is more than twice as large as the previous laboratory. The interior is finished with vitreous tile walls and terrazzo floors to resist chemical attack. A powerful ventilating system for the removal of fumes adds to the safety and comfort of the workers.

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New Lincoln Welding Awards Total $6750

The Rules and Conditions for the fifth annual competition of the Lincoln Arc Welding Foundation's Engineering Undergraduate Award and Scholarship Program are now available in a 24-page, illustrated booklet. The booklet shows pictures of the design and research projects described in award papers of previous competitions. Brief descriptions of last year's award papers are also presented along with a bibliography of welding texts and references.

This program is a competition for undergraduate engineers to encourage them to use imagination and ingenuity in developing an engineering project in their own field. All registered undergraduate engineers are eligible to compete. Awards totaling $6750 are made for the best papers on design of machines or structures, or separate components of machines or structures, in which arc welding is the method of fabrication. Welding research and maintenance projects can also be described. The 63 awards range from $1000 to $25. Scholarship Funds totaling $1750 are also awarded to schools for the establishment of scholarships in honor of the main student awards.

Rules booklets can be obtained by writing to James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.

★ ★ ★

Casting-Welding Practice Manual

Steel Founders' Society of America has published a comprehensive new manual incorporating most advanced technical data on welding of steel castings. The 40-page report, "Recommended Practices for the Welding of Steel Castings," comprises a valuable guide for steel foundries and related industries for use in establishing reliable welding procedures and experience-proved quality standards. Numerous drawings are included.

Copies can be had by writing F. Kermit Donaldson, Executive Vice President, Steel Founders' Society of America, 920 Midland Building, Cleveland 15, Ohio. The price, fixed at cost, is 35 cents per copy.

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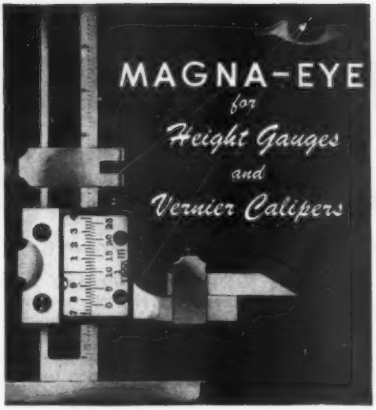

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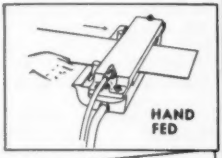

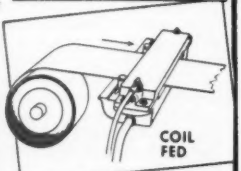

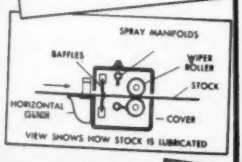

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A Compact Heat Treating Slide Chart is offered by The Carpenter Steel Co. This 5" x 11" chart gives complete answers to items such as heating speed, furnace atmosphere, temperature for drawing and time for drawing. It contains data on type analyses of the more popular types of die steels, forging heat, annealing treatment and hardening treatment. Also included on this convenient chart are facts on quenching, effect of drawing temperature on hardness, etc. Address requests to THE CARPENTER STEEL CO., 306 W. Bern St., Reading, Pa.
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A Third Manual on Gray Iron has been published by Gray Iron Founders' Society, Inc. "Advantages of the Gray Iron Casting Process and Products" covers functional advantages of castings, economic advantages of the casting process as a manufacturing method, and gray iron vs. other cast metals. A folder detailing contents and listing prices can be obtained from GRAY IRON FOUNDERS' SOCIETY, INC., 210 National City-E. 6th Bldg., Cleveland 14, Ohio.
Circle Inform-A-Gram No. C2.

"A Complete Guide to Successful Silver Brazing" is a QUICK-size, 46-page booklet offered by The American Platinum Works. This very informative booklet describes such subjects as preparation for brazing, brazing methods, thermal expansion of metals and joint design; contains useful charts on selection of fluxes, conversion and physical properties of metals. Write for a copy to THE AMERICAN PLATINUM WORKS, 231 New Jersey Railroad Ave., Newark, N. J.
Circle Inform-A-Gram No. C3.

"The Key to Remote Control" gives a detailed description of Tru-Lay Flexible Push-Pull Controls. These controls provide an efficient, accurate means of transferring push and/or pull movements from one location or mechanism to another. The 12-page booklet pictures and describes how they can be applied. AMERICAN CHAIN & CABLE CO., INC., Automotive & Aircraft Div., 601 Stephenson Bldg., Detroit 2, Mich.
Circle Inform-A-Gram No. C4.

"Haynes Stellite Metal-Cutting Tools" describes four different grades of cast cutting tool alloys, giving their physical, mechanical and chemical properties to help in selecting the right tool alloy for various operations. A brief description of chip formation and tool design, and their effects on tool life, is also included in this 44-page manual. Among the 80 illustrations and tables in the manual are tables giving proper cutting angles, speeds, feeds, etc. HAYNES STELLITE CO., Dept. T&P, Kokomo Ind., will honor all requests for this manual.
Circle Inform-A-Gram No. C5.

The Time Saver Disc is offered by Dayton Rogers Mfg. Co. to those in the manufacturing, designing and related fields. It gives decimal equivalents from 1" to 1/64". The diameter of tap, number of threads per inch and diameter of tap drill for U.S. Standard Screw Threads can also be had by simply turning the celluloid dial to the diameter of the tap required. On the reverse side is a similar table for A.S.M.E. Special Machine Screws, A.S.M.E. Standard Machine Screws, American Standard Taper Pipe Threads and S.A.E. Standard Screw Threads. Write on your company letterhead to DAYTON ROGERS MFG. CO., 2824 13th Ave. So., Minneapolis 7, Minn.
Circle Inform-A-Gram No. C6.

"Barrel-Finishing with Alundum Tumbling Abrasive" is Norton's latest, pocket-size book of know-how information. This 56-page booklet discusses such topics as barrel-finishing factors, cleaners, rust preventives, barrel-finishing procedure, roughing, finishing, processing of samples, etc. An 18-page section is devoted to practical hints for operators. Write to NORTON CO., 1 New Bond St., Worcester 6, Mass., and ask for a copy of Form No. 501.
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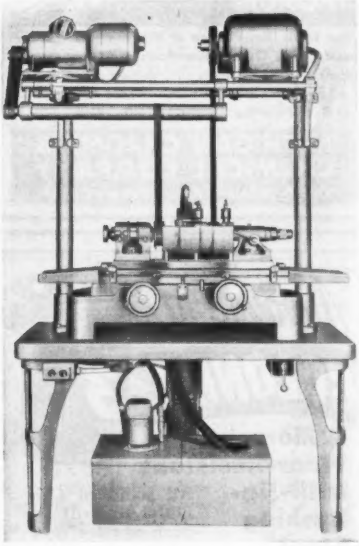

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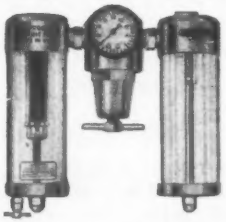

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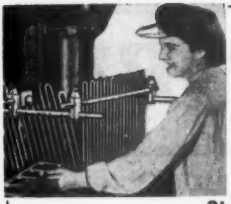

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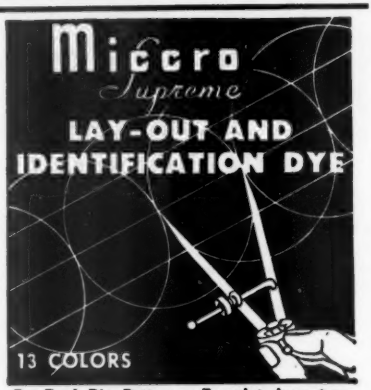

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Circle Inform-A-Gram No. C8.

"Manufacturing Equipment and Processes," by Lytle and Gould, aims to clarify the technicalities of the most basic equipment and processes now used in U. S. engineering shops. The book contains more than 700 pages and features test questions and bibliography at the end of each chapter. Price is $6.50. Write direct to LAUREL PUBLISHERS, Dept. T&P, Scranton 9, Pa.

A Comprehensive 1951 Data File of defense and maintenance - conservation welding problems is now available from Eutectic. This plastic bound book contains well over 100 pages of profusely illustrated technical data on maintenance and repair welding problems and procedures. A portion of this material consists of issues of the company's war-time maintenance and production tips magazine, "The Welder," containing useful information on metal-joining procedures perfected during the last war. EUTECTIC WELDING ALLOYS CORP., Dept. P, Flushing, N. Y.
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"Safety Saves!" is an amusing, yet functional booklet issued by Clark Equipment Co. Twenty-eight rules of correct industrial truck operation are cleverly illustrated by cartoons, and 16 more are listed. Clark fork-lift trucks, industrial towing tractors and powered hand trucks are also pictured. For a copy of this 24-page, pocket-size booklet, write to CLARK EQUIPMENT CO., Industrial Truck Div., Dept. T&P, Battle Creek, Mich.
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Ampco Alloys for the process industries are described in completely revised, 20-page Bulletin PI-3. This book includes corrosion-erosion-resistance and cavitation-pitting data along with physical and chemical properties of various aluminum bronze alloys. Address AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 46, Wis.
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Lathe Operator's Handbook. The revised 50th edition of "How to Run a Lathe" is available from South Bend Lathe Works. There are 128 pages describing the fundamental operations of modern lathe practice. This excellent book is obtainable in paper binding at 25¢ or in imitation leather fabrikoid at $1.00 a copy. SOUTH BEND LATHE WORKS, Dept. T&P, South Bend 22, Ind.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Training, from page 70

toward training as deciding upon a program because it is "something good for the boys." When such has been the case, as it has, the programs always have failed to fulfill their real potentials. Foremen, like all employees, are susceptible to the attitudes of their superiors, and a sincere and continuing interest, by management, thus will do much to dispel their instinctive resistance to participating in training—a factor which frequently is present.

None of the foregoing should be construed to mean that foreman training should not be instigated at the management level. It should, very definitely!

Management, as a group, is in the best position to know all present and impending problems which must be faced. Management, as a group, is best qualified to evaluate foreman training in terms of those problems. Yet, still and all, it pays off when management goes a step further and enlists the practical ideas of the foremen themselves, uses the know-how of the training director or other training specialists before saying, "this is it," on what the company's real training needs are.

Such a policy does more than merely assure that subjects which fill needs will make up the training program. A multiple approach is a practical guarantee of interest and cooperation throughout the program by all concerned.

It can be seen, as a result, that no one program or no one set group of subjects ever will continue to satisfy conditions within a plant indefinitely. There certainly can be no thought of setting up a training schedule which covers, say, cost control in September, human relations in October, and then be followed by production management in November. Problems just don't have a way of scheduling themselves anymore than people's needs have the habit of falling into a set pattern.

While, as has been mentioned earlier, there is real danger in pat answers and standard decisions on any aspect of foreman training, it can be said that once current training needs have been determined, the subjects which should not be covered become self-evident.

Each case will be an individual one, of course, but the following two points always can be made:

1. No subject which does not have a definite and immediate bearing upon the company's needs, as generally determined, ever should be included.

2. No generalizations should be substituted when specifics are called for; that is, human relations will be inadequate if absenteeism control is needed.

This all adds up to an inescapable fact: Training needs must be consistently as well as carefully studied. No program of foreman training which is so inflexible that once set up it cannot be readily changed to meet changing conditions should ever be started.

Among training experts there is the belief that a factory's training needs should be reviewed at least once a year in normal times. No one, however, has considered himself expert enough to define what normal times are.

Today, with the script for industry being changed as rapidly as it is, an annual review of training needs certainly is not adequate. This composite economy with demands from both military and civilians vying for attention has set up a lot of new ground rules under which both foremen and their training are going to have to operate.

Increased production to meet military demands is a factor, and a large factor, which must be reckoned with today. If it were the only factor, the training problem would be greatly simplified. Outstanding programs were designed during World War II with that one thought in mind.

Already there has been a substantial influx of new workers into factories throughout the country, and both their number and rate are scheduled to accelerate substantially in months to come. If the problems attendant to this were all that must be reckoned with, there is training developed in the past which might well be adapted. But these two factors represent only one small segment of half the problem which training must help industry solve today.

Thought also has to be given to those longer-term, broader-based objectives represented in the other, or civilian, side of the economy. This, while sub-

(Continued on page 162)

Acme Offers Complete Facilities for All Types of

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Acme is equipped to handle all types of precision grinding. Expert craftsmen, using newest methods and modern equipment, will do the job for you faster, better, more economically. Acme also offers a flat lapping service that can finish surfaces to within millionths. Write for details.

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THE Multiform BENDER

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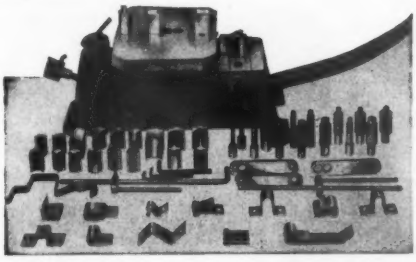


Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend and cut round or flat brass, bronze, aluminum, steel, etc., up to 3/16" x 1½" as illustrated, other models up to ¼" x 4". See our display booth H-154 at National Metal Show, Detroit, October 15th to 19th.

Write for descriptive literature.

J. A. RICHARDS CO.

NORTH PITCHER ST. KALAMAZOO, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

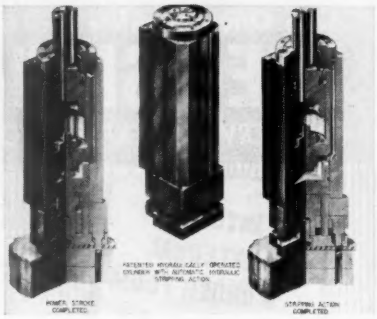
New Hydraulic Metalworking Equipment

To facilitate the piercing and sizing of holes, and to simplify many other special operations, a new line of hydraulic metalworking equipment has been developed.

These hydraulic machines are finding increasing applications in the automotive and aircraft industries. Typical operations are the simultaneous piercing of all holes and the trimming of automotive frame members, production riveting assembly operations on automotive frames, and producing accurately pierced holes and related assembly operations for jet engine components.

This wide range of applications is said to be due to the special features contained in the hydraulic cylinder—the basic unit of the machine. Built-in blankholding and stripping action, which is entirely automatic and requires no springs, is actuated hydraulically after the power stroke. The inherent compactness and rigidity of this construction permit producing holes under difficult conditions, such as punching steel that is thicker than the hole diameter. In one instance, $\frac{21}{64}$" diameter holes have been punched in $\frac{5}{16}$" high carbon SAE 1095 steel heat treated to 41 Rockwell C.

Principal features of the hydraulic system include continuous pressure intensification which permits wide flexibility in adding cylinders in the circuit of the power unit. A patented transfer valve permits handling extremely high pressures while eliminating hydraulic shock in the circuits. These features are basis for capacities up to over 200 tons in relatively small, compact cylinders. Other interesting applications for these hydraulic machines are found in convenient, small piercing units and riveting machines.



Photos courtesy Danly Machine Specialties, Inc.

Fig. 2. These cutaway views illustrate the action of the basic power cylinder. Stripping and blankholding are entirely automatic, requiring no springs or additional values. Compact design makes it possible to arrange these units at any angle in confined areas.

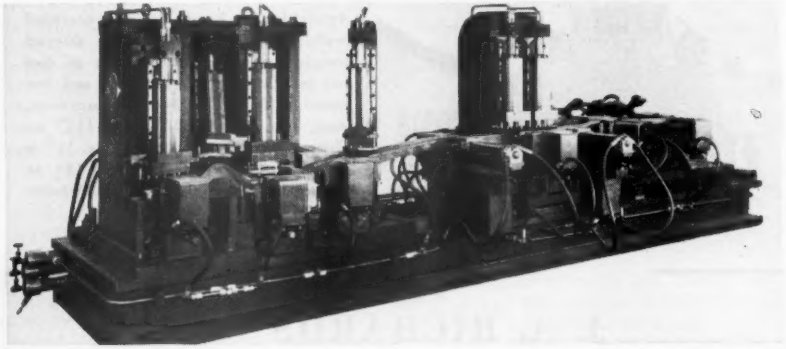


Fig. 1. This 16-unit hydraulic machine pierces the holes in the flanges and web of automotive frame side bars in one simple operation. The action of each cylinder features automatic hydraulic blankholding and stripping action.

SAVE
TIME and MONEY
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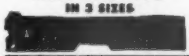
STOP-PINS
AVAILABLE IN 5 SIZES

FINGER STOPS
IN 3 SIZES



STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices.
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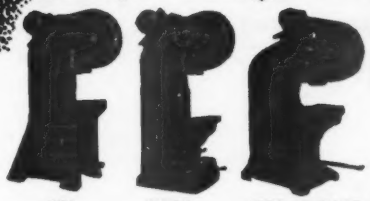

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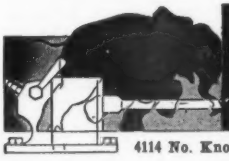

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

. . . Training, from page 158

ordinate today, certainly cannot be forgotten or fail to be planned for because it is sure to resume its regular importance. Many of today's foremen are totally unfamiliar or at least not conversant enough with the responsibilities they are called upon to assume under the demands imposed by a fiercely competitive normalcy. Those who have had such experience have gotten out of touch with more than the special skills needed in the over a decade of war production, sellers' market, and rearmament mobilization which business has experienced.

Admittedly, the points which have been raised here on foreman training have not been sharply defined except in principle. That is because it is impossible for any two factories to have exactly the same problems, the same long-range objectives or to operate under exactly the same conditions in today's indecisive economy. In defense of the points having been raised in the fashion they have is the very specific fact that foreman training is, at all times, an investment. Now, more than ever before, the value of that investment depends upon the planning and care which go into all aspects of its selection and administration.

★ ★ ★

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PALLEY SPECIALS on HYDRAULIC PUMPS & CYLINDERS
HYDRAULIC PUMP or MOTOR GEROTER TYPE
Logan Gerotor type. For operating hydraulic systems on trucks, tractors, etc. Delivers 8 GPM at 1200 RPM or 1000 PSI with 5 HP. Can also be used as Hydraulic fluid motor. 3/8" stand pipe ports. ½" splined shaft for pulley or direct attachment. 5½" dia., 7" long. Used but condition guaranteed.
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Gives 20,000 lb. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore; 18" stroke; 30½" length. Ideal for road-farm — shop machinery.
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P-3 STRATO POWER PUMP
With built-in variable flow control valve in head. Positive displacement piston type. Displacement capacity: 2 gal. per min. at 1500 RPM or 1250 PSI. Pressure limit 1250 PSI continuous. 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent max. 4500 RPM. Rotates either direction without adjustment . .
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Positive displacement type, angle piston. Displaces .507 cu. in. per revolution. Has capacity of 6 gal. per min. at 3000 RPM or 1500 PSI., continuous, 1875 for 15 sec. Operating speed of 3750 RPM, intermittent maximum, 4500 RPM. Rotates to the right only.
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4 WAY VALVE
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Selling to the Armed Services

"Six Steps in Selling to the Armed Services," a 12-page booklet issued last April by the Chamber of Commerce of the United States, has been made available again now that mobilization is passing from the "tooling-up" phase into a period of volume production. It serves as a concise guide for companies interested in getting defense contracts and subcontracts. The six steps that are detailed are as follows: (1) know government buying procedures; (2) make your plant capabilities known; (3) find the right buying office; (4) sell as strongly as in commercial practice; (5) seek subcontracts as well as prime; and (6) know when to visit Washington . . . when not to.

Single copies are available at 15 cents each from the Department of Manufacture, Chamber of Commerce of the United States, Washington 6, D. C. Quantity prices will be furnished on request.

Fixture for Broaching Stator Rings

Pictured here is a conventional broaching machine, although it looks like a special machine. Actually, what is special about it is the elaborate fixture. This fixture has been designed to accommodate all sizes of stator rings from 38" to 48" in diameter. Manufacturers of locomotive gas turbine engines or stationary power plants have found this special fixture highly efficient. It makes possible the broaching of 40 to 100 slots in stator rings at a production speed of 35 seconds per slot.

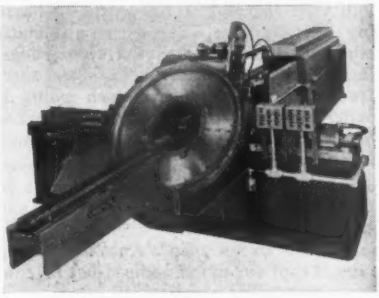


Photo courtesy The Lapointe Machine Tool Co.

The fixture is built with adjustable travel of 15", hydraulic index, hydraulic plunger and fully automatic lubrication.

Because it is generally recognized that the straight-line horizontal pull is a very efficient and accurate broaching method for cutting slots in exceptionally large stator rings, the broaching machine on which this fixture is mounted is a horizontal, 20-ton, 90" stroke machine with conventional high speed return.

★ ★ ★

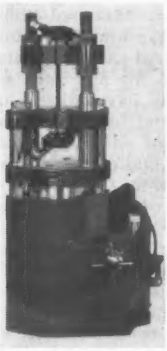
UNIVERSAL METAL PRODUCTS, INC., manufacturers of flat springs, wire forms, stampings, spring fasteners, split tube spacers and small assemblies, recently moved into a new plant in Wickliffe, Ohio, on the eastern outskirts of Cleveland. Modern facilities in the new building will permit large volume production of these parts. The five-year-old company is headed by Thomas O. Dahlstrand, president; T. C. Dahlstrand, treasurer; and E. G. Carlson, secretary.

Fast Tensile Testing

A practical tensile tester that is simple, accurate and fast to operate, is now available for testing spotwelds, strip, wire, etc.

This machine is made in 10,000 and 20,000 lb. capacities and the operation is unusually simple. Movement of the ram is controlled by a graduated dial and spoked knob on the front of the machine. Various speeds are obtained by turning the dial to the right. A small movement to the left returns the ram to the down position.

In standard arrangement shown in the left-hand illustration, the grips are open sided, permitting easy insertion of the specimen. Pulling the handles together



Photos courtesy Detroit Testing Machine Co.

lightly engages the test piece, after which the grips are self-acting. The pulling members are adjustable to take specimens 5 to 9" OA. or to your requirements.

The load is applied hydraulically by means of a gear pump of the rotary type. Pump gears are hardened and ground, and shafts are ball-bearing mounted. The motor is mounted at the rear and is coupled directly to the pump. This motor is a ½ hp, 110-220 volt, single-phase, 60 cycle, 1725 rpm unit.

One load gage (right-hand illustration) to specification is included as standard equipment. Additional load gages and various types of grips are available to suit requirements.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Automatic Oilers Cut Lubrication Costs

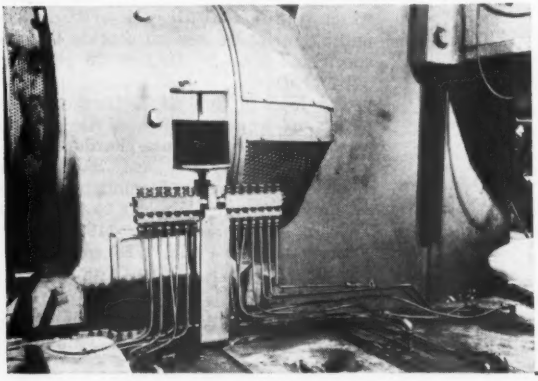
A 74 per cent cut in lubrication costs, 50 per cent reduction in the amount of lubricating oil used and a 90 per cent reduction in the operation and maintenance time and work of oilers were achieved by the Nordberg Manufacturing Company of Milwaukee, Wisconsin, when three solenoid operated automatic oilers replaced 30 manually operated individual oiling cups on one of Nordberg's 100" boring mills. The automatic oilers cut lubricating costs for the one machine from $281 to $75 per year. These savings do not include replacement cost of burned-out bearings experienced with the old method, or other incidental benefits.

Under the old system, each of the 30 points on the boring mill was equipped with its own oiling cup that had to be filled daily by the machine operator. Individual oiling required shut-down and the operator's time to fill and turn on each cup individually. Over-oiling, uncontrolled flow of oil and failure to shut off oilers at the end of each day shift wasted in excess of 31 gallons of oil per year. Failure to turn on oilers at the start of the day caused excessive wear on bearings. Spillage of oil over machine and surrounding floor endangered personnel and machine safety and efficiency. Another disadvantage of the individual oiling cups was that they had a tendency to lubricate excessively at the start and gradually starve bearings during the remainder of operation, also causing excessive wear on bearings and reducing machine efficiency and life.

Three solenoid operated automatic oilers replaced the 30 individual oiling cups, reducing the number of oiling units to maintain and operate by 90 per cent. All 30 points on the boring mill are fed from three centrally located reservoirs that feed oil by gravity to 14, eight and eight outlets, respectively. Easily adjustable individual valves at the outlets regulate the flow of oil as desired to each point to be lubricated, completely eliminating waste, spillage and the possibility of starving and eventually burning out bearings. Since the automatic oilers were installed, not a single bearing has had to be replaced. The sight feed valves assure that each point is being oiled and provide a visible means to maintain desired flowage at all times.

Solenoids of the oilers are connected across the line of the driving motor so that their operation is started and stopped automatically when the motor is started or stopped. Another advantage is that the machine need not be shut down for filling reservoirs.

Transparent reservoirs of the oilers are made for safe use at temperatures above 160° F and are large enough to hold a week's supply per filling, further reducing maintenance time.



One of the centrally located reservoirs is shown in the illustration. This reservoir feeds 14 outlets with the flow of oil to each outlet controlled by an adjustable individual valve. Sight feed valves assure that each point is being oiled and provide a visible means to maintain the desired flowage.

Photo courtesy Oil-Rite Corp.

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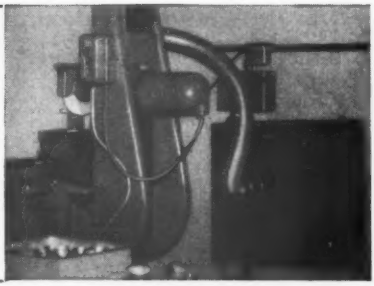

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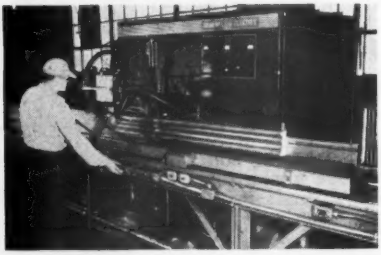
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

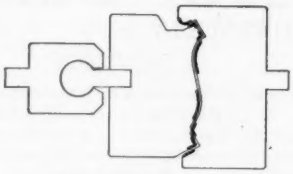
Induction Hardening Multiplies Useful Die Life

From a study recently completed on die life in bending and forming steel plate and sheet metal in press brakes, reports show induction-hardened dies have from ten to twenty times the useful life of the conventional heat-treated dies used in press brakes. This study covered dies in use up to five years and included a wide variety of conditions in size and complexity of dies.

Developed originally some seven years ago as a means of supplying superior dies for uses of press brakes, the demand for these induction-hardened dies increased so that today induction-hardened dies are used on all makes and sizes of press brakes.



According to research and development engineers, this superior performance of induction-hardened dies is due to the accurate control of both the degree and depth of hardness over the entire length of the die. The photograph above shows a close-up of the "action area" of one of the special machines developed for this induction-hardening of press brake dies. The machine consists of a traveling unit to handle both male and female bending and forming dies of any length. Adjustable, automatic controls govern the speed of the die through the special, high-frequency induction-heating unit and the quenching station for obtaining a predetermined depth and degree of hardness that is uniform the entire length of the die. The heavy lines on the drawing show the surfaces of this die that are induction-hardened. This specially developed process for induction-hardening of press brake dies adds very little, if anything, to the cost of the conventional, heat-treated dies and, because of the much longer useful life, does show an appreciable saving in over-all die costs for bending and forming operations on all makes of press brakes.



Photos courtesy Dreis & Krump Mfg. Co.

★ ★ ★

Shown below is a metal disintegrator that removes a broken tap from a defense work part worth $400 that might otherwise have to be scrapped. The Thomas Metalmaster shown, controls a vibrating electrode that is hollow, carrying coolant and electrical current through the work and into the broken tap. From .002" to .004" of the tap is removed with each vibration of the electrode. The work part remains cool and the broken tap literally falls out of the work as the tap disintegrates.

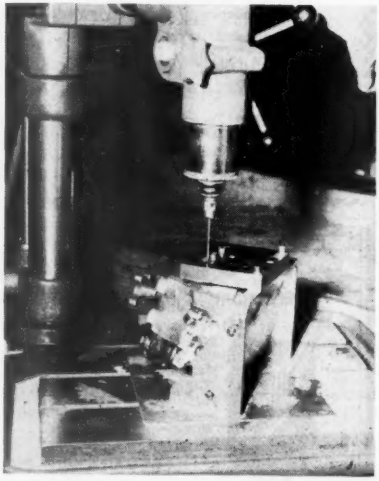


Photo courtesy Warner Division, Clinton Machine Co.

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spaces holes to jig borer accuracy. Excellent for batch quantities. Fits any vertical milling machine.

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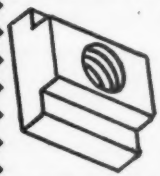

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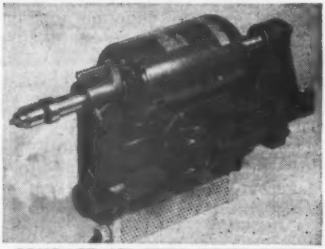
INCREASE PRODUCTION . . .



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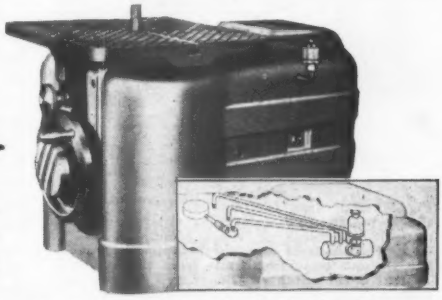
GRIND DIFFICULT CONTOURS WITH SPEED AND ACCURACY

BOYAR—SCHULTZ No. 1 PROFILE GRINDER



This New Improved Oiling System was developed to keep the spindle thoroughly lubricated thus increasing its life of accurate grinding. The vertical oscillating ways are also lubricated in the same system.

With higher standards of accuracy in demand . . . and at lower costs, the tool known to supply both is a favorite with every user.

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See our No. 2 Profile Grinder for larger and heavier profile grinding.

BOYAR-SCHULTZ CORPORATION 2112 Walnut Street, Chicago 12, Ill.

SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Metal Stitching Speeds Aluminum Door Assembly

By replacing drilling and riveting with metal stitching, the Tomfohr Overhead Door Company of Portland, Ore., has increased its production of aluminum door assemblies more than 30 per cent. In addition, fastener costs have been lowered approximately 75 per cent and labor charges reduced more than 65 per cent.

Formerly, two men were required for drilling and riveting operations. Working together, they assembled one door every 55 minutes, or nine doors per eight-hour shift. With metal stitching, one man is now able to complete a door every 45 minutes, or 12 doors per eight-hour shift.

The metal stitching technique was decided upon after two other fastening methods failed to produce high-strength assemblies. First to be rejected was

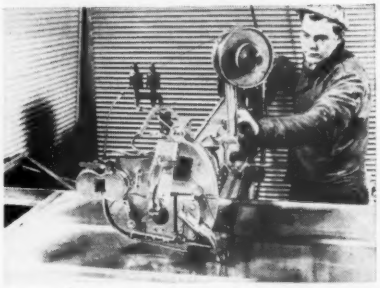
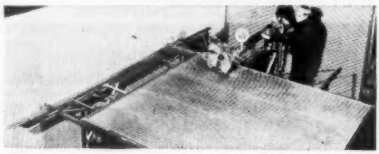


Fig. 1. Operator positions stitching head of the metal stitcher and drives stitches through a 0.40″ thickness of sheet aluminum and a 0.72″ thickness of structural supporting member without removing hands from the machine. A light-beam stitch positioner and a round-ball marking gage speed stitch location.

spot-welding. Of the two sheet-metal surfaces available on these industrial, airplane hangar and domestic-type doors, the corrugated aluminum sheets were impossible to weld and the flat sheets with V-section bracing could be welded only if a special surface preparation was used—and then with difficulty.

Fastening by riveting produced better results. However, the necessity for hole alignment prior to placement of rivets and the tendency of hand-held rivets to be dropped, consumed valuable production man-hours. More serious than this was the frequency of rejects caused by rivets dropping out of their holes.

An average of one door in ten assembled by riveting had to be rejected because of defective rivets. However, not



Photos courtesy Acme Steel Co.

Fig. 2. Over-all shot shows 8 x 8 ft. corrugated-aluminum door assembly being stitched on the four-directional table.

one door in fifty is rejected for defective stitches. Also, the problems connected with hole alignment and the manual handling of rivets are eliminated because the stitch makes its own hole as it is driven and the stitching wire is alway in place in the stitching head ready to be formed and driven.

In this application, stitches having $\frac{7}{16}$″ crowns (internal distance between legs), join the sheet aluminum faces of these doors to aluminum structural supporting members. Stitches are formed from 18-gauge stainless steel wire in the following manner: Wire is fed from the 10-lb. coil, cut to length, formed into a stitch, driven through the required material thickness and clinched in ⅛ second. Because stitches are fully supported as they are driven, they can penetrate thicknesses three to four times their diameters.

A special setup, consisting of a power-operated table, movable in four directions, and a metal stitcher with a 4 ft. throat was designed and installed by Tomfohr engineers to adapt the production of this 8 x 8 ft. all-aluminum door to metal stitching. Thus the head reaches the center of the work and controls at the rear of the machine permit the operator to move the table and to drive the stitches without changing hands.

MILWAUKEE DIE FILERS PROFILE GRINDERS

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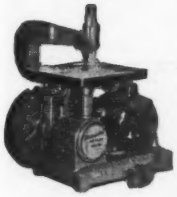

DIE FILER
Model FS shown performs all die making operations. Equipment includes File Roller Support Overarm in addition to overarm shown.

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SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Production Threading on Lathes and Millers

An integrally-powered lead attachment for production threading on lathes, milling machines and some plain grinders makes possible threads of greater accuracy and better finish at higher speeds.

Designed primarily as a work-holding and leading device for multiple-form cutter thread milling on lathes or milling machines, the attachment can also be used to provide the lead for multi-rib wheel thread grinding on plain grinders.

Operation is simple. For milling, the attachment is mounted on the lathe cross slide or the milling machine table. A suitable multi-form thread-milling cutter is mounted in the lathe spindle or milling machine spindle by means of a collet or taper seat, as determined by the cutter shank used. Short workpieces, to approximately 6" diameter, can be mounted in the three-jaw chuck provided with the attachment. Pieces up to 7" diameter or of irregular contour can be mounted on a face plate which is provided. Long work, up to 2½" diameter, will pass through the attachment spindle. Collets, split bushings and a long-work support are available for work diameters from 1/32" to 2½". Thread lengths up to the work diameter, or a maximum of 2", can be cut on material to a hardness of Rc40 in 1 1/16 revolutions of the workpiece.

Soft materials can be threaded in lengths to 1½ times the work diameter, or 3" maximum if workpiece is more than 2" diameter. Pitch range is from 6 to 40 tpi. Multiple threads can be produced without difficulty, provided *lead* is no coarser than 6 tpi.

Samples of workpieces threaded by means of the new lead attachment for lathes and millers.

The attachment is integrally powered by a 1/30 hp, two-speed (750 and 1500 rpm) motor operating at a reduction of 1081 to 1. Any conventional three-phase voltage is available.

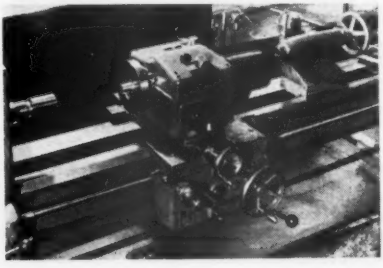
Motor is reversible to provide for cutting left and right-hand, or internal and external threads. Limit switches at each end of the lead indicator prevent overtravel of the spindle and a scale shows spindle position at all times, both for setup and operation. Six spindle speeds are available by various combinations of motor speed and internal gearing, shifted by a lever.

Master screw sets can be provided for all of the standard leads, and the same set is used for all forms and diameters, provided the lead is the same. Except for full square and buttress style threads, any form can be cut.

This device, attached to the cross slide of a standard toolroom or engine lathe, or on the table of a conventional milling machine, will immediately convert any of these into an accurate, high production, thread milling machine. The normal function of the machine is not impaired; the attachment is easily removed when the threading job is completed.

The new thread milling attachment, attached to the cross slide of a standard lathe, permitting the lathe to produce accurate threads.

Photos courtesy Gubelin International Corp.



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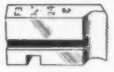

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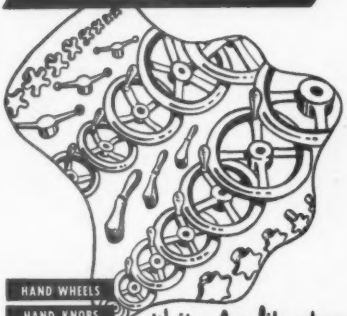

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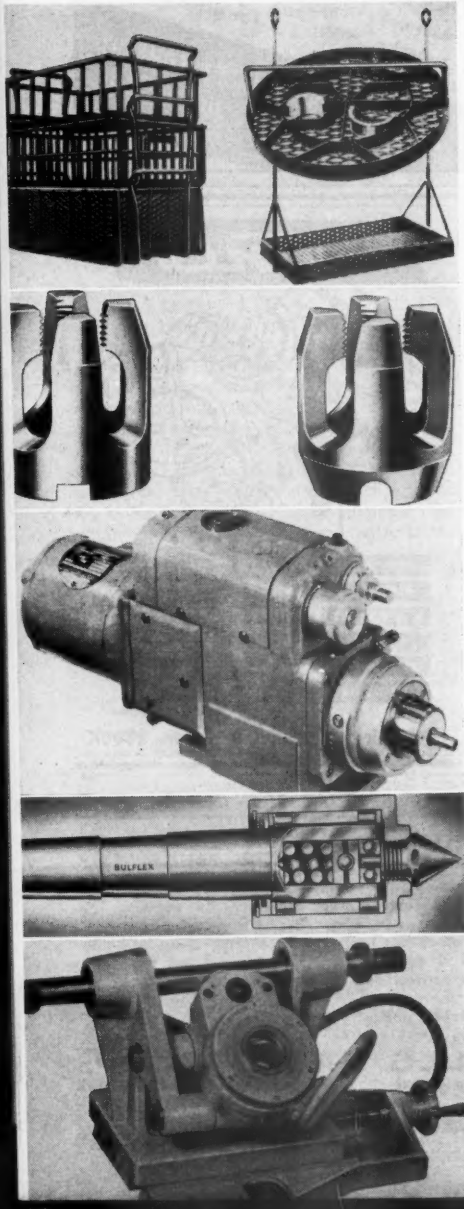


Rubber-Cushioned Handling Baskets, pans, spacers, chutes, hooks, racks, etc., developed by Automotive Rubber Co., Inc., make it possible to handle large quantities of fragile parts quickly and without slippage, marring or scratching. The extra cost of tough, yet soft rubber and synthetic covering can be paid for quickly in savings on rejects. Write to AUTOMOTIVE RUBBER CO., INC., 8601 Epworth Blvd., Detroit 4, Mich.
Circle Inform-A-Gram No. A1.

P&W Monocone Dies and Die Holders for screw machines and other equipment are now being produced as companion products to the Duocone line of dies and holders. Illustrated are a Monocone (left) and a Duocone Die. The additions now provide users with a choice of two popular types of concentric-adjustment dies—flat-backed and cone-backed—from a single source. Holders for both types are produced in both reversing and releasing types. PRATT & WHITNEY, 15 Charter Oak Blvd., W. Hartford 1, Conn.
Circle Inform-A-Gram No. A2.

The Delta 19-150 Air-Hydraulic Drill Unit has been developed for high production work on drilling, reaming, tapping, etc. It has been designed as a basic unit adaptable to special machines for high production drilling, etc. Because of its infinite feeds, which eliminate the need for cams, the unit can be quickly adjusted for each operation. DELTA POWER TOOL DIV., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Circle Inform-A-Gram No. A3.

Bultool Spring-Loaded Live Centers feature a powerful spring that controls all end thrust. Massive roller bearings assure sustained accuracy with heavy loads, deep cuts, and high speeds and feeds. Three spring-loaded styles (including the Type FH shown) and three non-spring loaded live centers are fully described in a new circular. Write THE BULTOOL SALES CO., 9101 E. Jefferson Ave., Detroit 14, Mich.
Circle Inform-A-Gram No. A4.

A New Cam Rise Gaging Device measures cam contours (both angle and amount of concentricity) by optical means, and simplifies and speeds up accurate eccentricity measurements. The deviation in a cam surface at any angle of arc, from minimum to maximum radii, can be quickly measured to ten thousandths of an inch. For a bulletin describing other features, write to F. T. GRISWOLD MFG. CO., Dept. T&P, Wayne, Pa.
Circle Inform-A-Gram No. A5.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

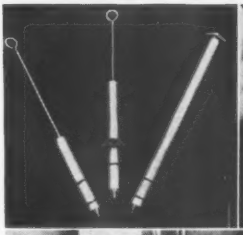
Tubular Multilift Magnetools (inside cut) can be used for entering small openings such as blind holes, removing boring chips from castings. They are especially designed to remove steel chips or parts from other steel surfaces, chips from cutting machines, etc. A patented brass pickup tip prevents sticking. Magnetools are permanent and not electric, are resistant to water, oil and gasoline. MULTIFINISH MFG. CO., Dept. 536, 2114 Monroe Ave., Detroit 7, Mich.
Circle Inform-A-Gram No. A6.

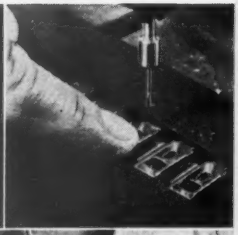
New W-S Small Reamers (outside cut) hold tolerances to .0002". They are carefully ground and honed to give very sharp cutting edges and to minimize sticking of the metal to the cutting edge. Tool sizes range from .0005" to ¼" dia. Flat, half-round and fluted (spiral or straight) types can be supplied. Complete information will be furnished by WOODRUFF & STOKES CO., INC., 349 Lincoln St., Hingham, Mass.
Circle Inform-A-Gram No. A7.

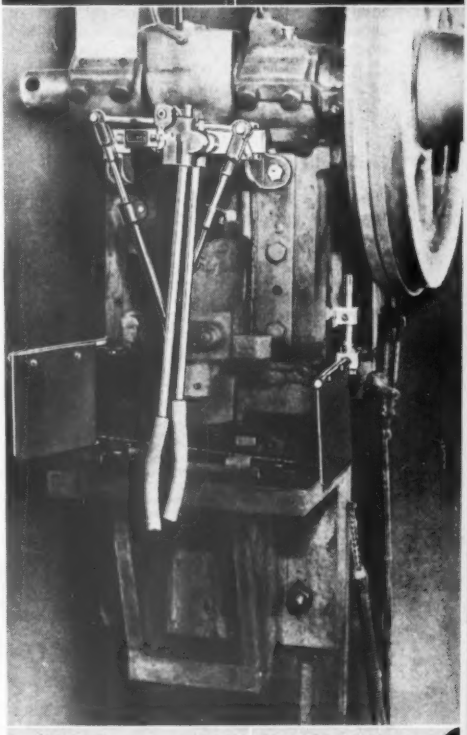
The New Searjeant Double-Arm Sweep-Type Guard is well adapted to short-stroke, long-die power presses. An exclusive half-speed action of the two arms completely eliminates any tendency to snap. Only a smooth "wiping" action results. The arms do not interfere with two-handed operation. This protective device can be easily swung to one side when necessary. SEARJEANT METAL PRODUCTS, INC., Box 71, Mendon, N. Y., can provide more detailed information.
Circle Inform-A-Gram No. A8.

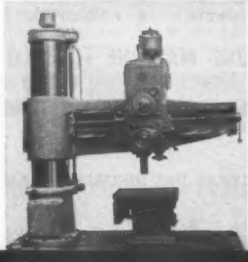
The Kolb Line of Radial Drills (inside cut) has been introduced in the U. S. by Cosa Corp. Made in various capacities for light, medium or heavy duty, they have hardened and ground gears sliding on hardened and ground spline shafts rotating on ball bearings. A feature is the electro-hydraulic clamping system for rigid locking of column and spindle head. Address COSA CORP., 405 Lexington Ave., New York 17, N. Y.
Circle Inform-A-Gram No. A9.

A Bench-Type Parts Cleaner (outside cut), the Brush-Flat, with handy Fountain Brush Action, has been developed by Graymills. It features a hollow handle brush attached to the pump, with a tube, to produce a steady flow of clear solvent at the end of the bristles. Oil, grease and dirt are flushed away as they are loosened with the brush. GRAYMILLS CORP., 2004 Ridge Ave., Evanston, Ill., will send literature.
Circle Inform-A-Gram No. A10.

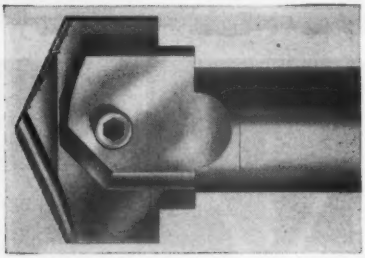








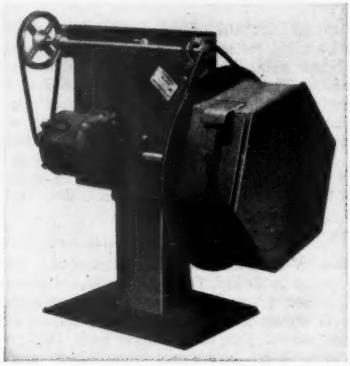
Conner Standard Spade Drills will drill the required diameter in one operation, from the



solid, need no retracting to clear them of chips. Eight sizes of tool holders hold 254 stock sizes of high speed spade drills in sizes 1" to 5" dia., in steps of 1/64". All holders accommodate core drills. CONNER TOOL & CUTTER CO., 1000 E. McNichols Rd., Detroit 3, Mich., will send its new, 52-page Catalog No. 51.

Circle Inform-A-Gram No. A11.

Rampe's New Portable, Universal Tumbler-Mixer tilts through a full 90° arc so that work can be tumbled at the best angle. Adjustable turn-table clamps permit standard and odd shaped containers to be used. Excellent for a variety of jobs, the machine can be used to mix paints and add colors to ceramic



granules. RAMPE MFG. CO., Dept. T&P, 3320 St. Clair Ave., Cleveland, Ohio, can provide a detailed, illustrated brochure on this Tumbler-Mixer.

Circle Inform-A-Gram No. A12.

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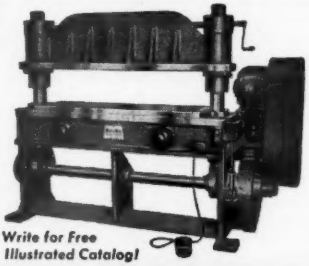

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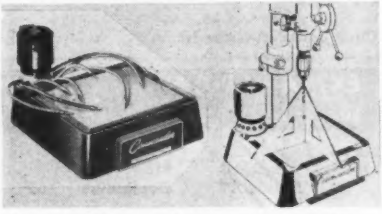
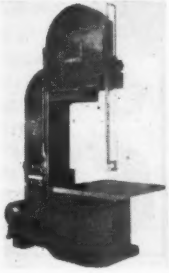
The Dual Thread Comparator is a companion instrument to Hanson - Whitney's Standard Thread Comparator and provides a more thorough visual inspection of externally threaded parts up to 1½" dia. It has, along with the jaw that checks assembleability by means of one composite reading of pitch diameter, lead and angle, a second jaw with a two-thread engagement that provides a specific pitch diameter check, as well as a check of back taper on very short threads. HANSON-WHITNEY CO., Dept. T&P, Hartford 2, Conn. **Circle Inform-A-Gram No. A13.**

The Commander Precision Drilling Coolant Table is equipped with a built-in pump and reservoir and eight semi-rigid, flexible metal coolant nozzles. It takes advantage of a



shorter coolant circulating stream to deliver full volume flow from one to eight nozzles, assuring an adequate supply of coolant at the precise point the user desires. Write COMMANDER MFG. CO., 4228 W. Kinzie Ave., Chicago 24, Ill.
Circle Inform-A-Gram No. A14.

A Huge Band Saw for cutting magnesium and aluminum castings was recently furnished to Wright Aeronautical Corp. by The Tannewitz Works. It has clearance of 55" under the guide, is of welded construction and employs 42" wheels. All controls are within easy reach of the operator. Detailed information on Tannewitz Band Saws can be had from THE TANNEWITZ WORKS, Dept. T&P, Grand Rapids, Mich. **Circle No. A15.**



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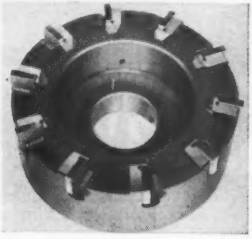
Protectron's vigilant, automatic protection enables one man to operate four machines . . . thus releasing three men for other work.

The Brinnell Company
SIMSBURY, CONN.

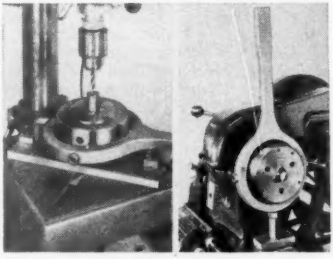
SEE ADVERTISERS INDEX, PAGE 137, FOR KEY NUMBERS

Milling Cutter. A new type of Futurmil solid carbide indexable blade face mill has been designed for milling cast armor plate and other difficult steel machining jobs. This cutter retains the Futurmil principle of multiple production runs without cutter grinding; the solid carbide blades, when dull, being merely indexed to a new cutting edge since the clearance angles are taken care of by the position of the blade in the cutter



body rather than being ground onto the blade. DETROIT MILLING CUTTER CO., 28625 Grand River Ave., Farmington, Mich., will supply full details.
Circle Inform-A-Gram No. A16.

The Standard Hampton Speed Chuck has a wide capacity range and handles all



shapes of stock with the same jaws. It permits individual jaw adjustment for zeroing run-out, or compensating for wear as it occurs. Round work can be gripped or released without stopping the chuck on lathe applications. Chucking is accurate and will repeat to a matter of "tenths." Complete information and prices are available by writing to WALLACE PAWLEY ENTERPRISES, 990 E. Slauson Ave., Los Angeles 11, Calif.
Circle Inform-A-Gram No. A17.

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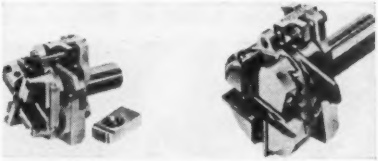
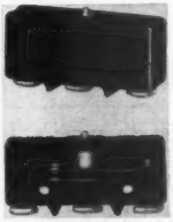
Newark N. J.

A New Die Head Line for B&S Automatics and small turret lathes is announced by Jones & Lamson. Class III threads are guaranteed. Desirable features include: both radial and tangent chasers mounted on face of die for free coolant flow and good chip



clearance; Dualife insert chasers for No. 00 machine dies, allowing turning over and using the other side; and two-thirds of this line, using tangent chasers, provides permanent throat features. JONES & LAMSON MACHINE CO., Catalog Dept. T&P, Springfield, Vt.

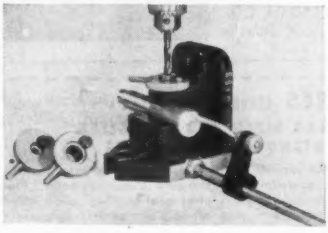
Circle Inform-A-Gram No. A18.



The "Du.op Switch" has been developed for use in applications requiring a compact, light-weight, long-life, limit switch. As a direct-action switch, the du.op has no inherent characteristics of bounce. There is no operating-motion contact delay. Write GENERAL CONTROL CO., Dept., T&P, Boston 34, Mass.

Circle Inform-A-Gram No. A19.

The New Mathewson Adjustable Drill Jig has a more positive and more easily adjustable combination stop that can be used on



either right or left side. This stop makes it possible to feed all work in the same direction and quickly make changes from drilling cap screws to drilling round or hex stock at any distance from the end. Address MATHEWSON MACHINE WORKS, INC., 2 Hancock St., North Quincy 2, Mass.

Circle Inform-A-Gram No. A20.

What do you want in a Socket Screw?
• Special Alloy Steel
• Fine Compact Grain
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• Uniform Quality
• Great Strength
• Right Temper
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they're all in B-RIGHT-ON SocketScrews
Get the facts on Brighton Nu-Process and Uni-Quality! See your nearest mill supply house or write for detailed catalog.
BRIGHTON
Screw & Manufacturing Co.
1839 Reading Road
Cincinnati 2, O.

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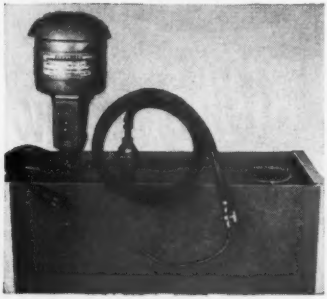
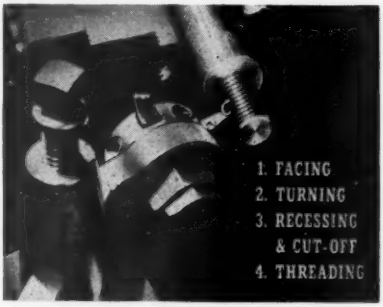
Shellback's Model 10-10 Portable Coolant Unit has a capacity of 30 gallons per minute and will pump up to 12 ft. It was designed



to furnish ample cooling for an eight-or ten-spindle drill press but may also be operated efficiently on a single spindle drill press, lathe, broaching machine, etc. Descriptive literature is offered by the manufacturer, SHELLBACK MFG. CO., 1320 E. Elza, Hazel Park, Mich.

Circle Inform-A-Gram No. A21.

The Wilgus Vertical Turret Tool Holder permits five separate operations to be performed with one setting. It can hold four differently ground tool bits which can be brought into working position by indexing the turret. Intended as a time-saver on most engine lathe work, the holder can be used on work between centers as it does not interfere with



the tail stock. WILGUS MFG. CO., 1722 E. 16th St., Los Angeles 21, Calif., will send full particulars.

Circle Inform-A-Gram No. A22.

THESE HANDNIBS LEAD IN POPULARITY

These indispensable handymen of the shop shear and nibble (outside and inside) up to 3/16" flat stock; openings for cutting 1/16", 1/4", 5/16", 3/8" rods. No. 5 also punches up to 1/2" holes in 1/8" stock. No. 4 available for bench or vise mounting; No. 5 standard or swivel bench mounted. Write for full details or ask your dealer for a demonstration.

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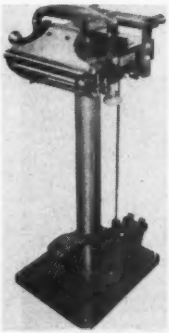
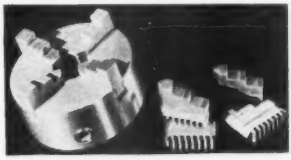


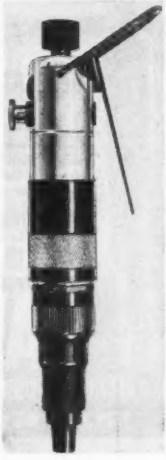
A New Model "Bend-it" Metal Forming Machine is announced by Kilham Engineering, Inc. With a capacity to bend 15" of 18 gauge mild steel or equivalent, this macine forms sheet, strip and rod stock and small tubing into many complex as well as simple shapes. It will form any desired radius from 1/32" to ⅝". Write KILHAM ENGINEERING, INC., Dept. T&P, Plainsville, Mass. **Inform-A-Gram No. A23.**

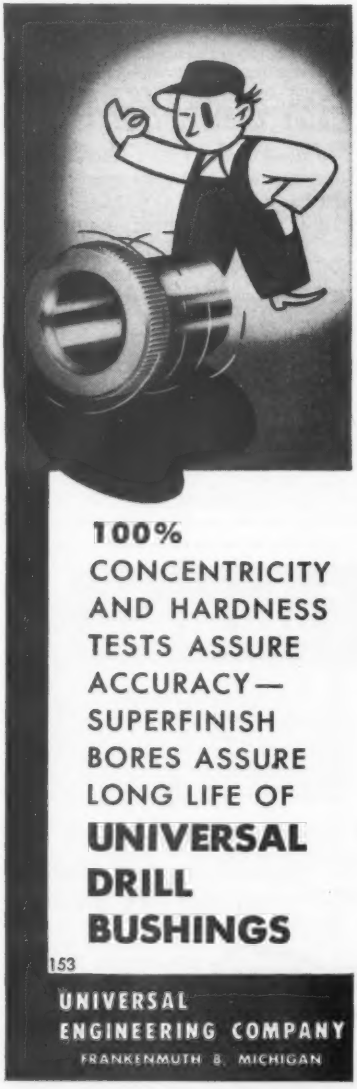
Burnerd Precision Chucks are being distributed in the U.S. by DeWitt Equipment Co. These English-made chucks feature extreme accuracy, powerful grip, maximum weight and overhang, hard wear and long



life, and quick, smooth operation. Scroll is of nickel-chrome steel specially hardened and tempered. Address DEWITT EQUIPMENT CO., 136, Lafayette St., New York 13, N. Y. **Circle Inform-A-Gram No. A24.**

A New Aro Air-Powered Screw Driver and nut setter, Model 7500, is designed with a push-button control that provides instantaneous reverse action. The operator merely presses a button on the tool and instantly the action is reversed. When forward motion is again desired, the operator removes his thumb from the button, which is instantly spring-released. In either case, the tool need not be removed from the work, and no adjustment time is required. ARO EQUIPMENT CO., Dept. T&P, Bryan, Ohio. **Circle No. A25.**





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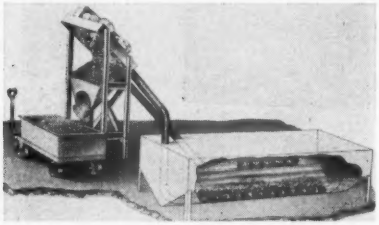
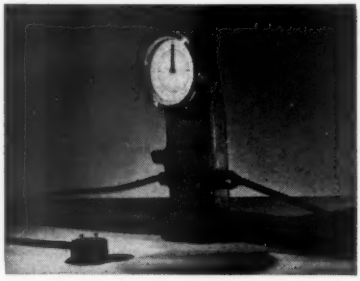
The Houdaille Automatic Clarifier System removes abrasives and other solid contaminants from machine tool coolants, transports waste to a disposal point and cleans its own filtering screens in automatically timed cycles. Equipment consists of a multiple-screen clarifier, blowdown tank with conveyor, and an automatic control panel. Contamination, removed from clarifier screens by blowdown action, settles in V-bottomed blowdown tank and is automatically removed to



disposal point by built-in, tube-enclosed Houdaille chain conveyor. Write HONAN-CRANE CORP., 208 Indianapolis, Ave., Lebanon, Ind., for more information.

Circle Inform-A-Gram No. A26.

The Distometer is an instrument for measuring the working length during lathe operation. It has a tolerance of ± .0001". The



automatic, electrical arrangement for zero adjustment, accomplished by a hand movement, eliminates practically all waste of time taken for measurement. All shafts are furnished with SKF ball bearings. WILLIAM SCOTT MACHINERY CO., 27462 Van Dyke Ave., Centerline, Mich., offers descriptive literature and complete information on this new instrument.

Circle Inform-A-Gram No. A27.

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SOLID CARBIDE DRILLS, developed by RAYMAC . . . cut, do not burn thru hardened metals at slower speeds . . . give cleaner and more accurate holes . . . less drill breakage and longer drill point life.

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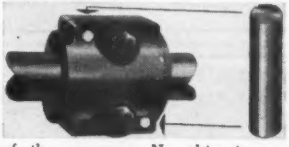
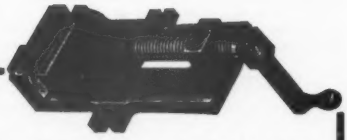
Carbide Tool Grinder. The Safag No. 27 Hard Metal Tool Grinding and Lapping Machine is now carried in the U.S. by Carl Hirschmann Co. Universally applicable for all hard metal tools for any kind of Swiss or Swiss-type screw machine, the No. 27 has a 5.9" dia. grinding wheel. Maximum shank size of tool to be ground is .8 x 1". Full details can be had from CARL HIRSCHMANN CO., 30 Park Ave., Manhasset, N. Y. **Circle Inform-A-Gram No. A28.**

The "Lok Dowel" is a precision grooved pin which provides a simplified method of establishing and retaining accurate alignment between component parts of any mechanical device, dies, jigs and fixtures, etc. Four parallel grooves impressed along half the length of the Lok Dowel displace a carefully determined amount of metal to each



side of the groove. No chip is removed. When the pin is forced into a hole, the crests of the eight flutes are forced back into the grooves, but the resiliency of the metal sets up outward radial forces that securely lock the grooved portion of the pin in place. DRIV-LOK PIN CO., Dept. T&P, Sycamore, Ill.
Circle Inform-A-Gram No. A29.

The New Catskill Wet & Dry Abrasive Cut-Off Machine of Joseph E. Murphy Co. serves a double purpose — for use where fast cutting is needed on hard steel, and for cutting all non-ferrous metals and plastics with wet cutting attachment fully enclosed. JOSEPH E. MURPHY CO., 24 Ellsworth St., Worcester 3, Mass., can supply detailed Bulletin No. 550.
Circle Inform-A-Gram No. A30.



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OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
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Do you need a vise of ANY type?

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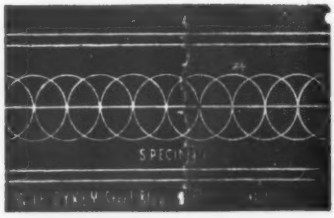

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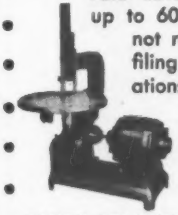

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Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

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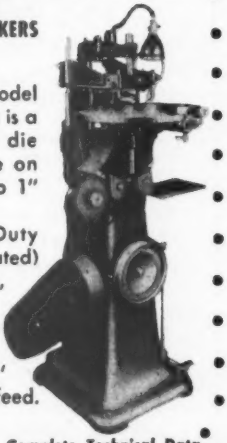

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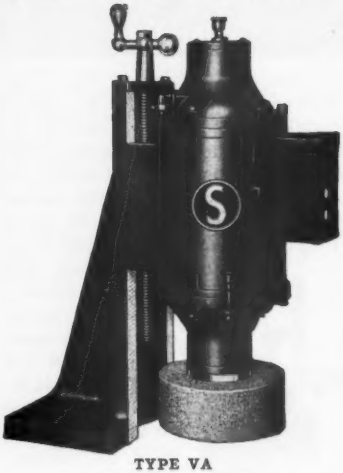

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Vertical hand adjustment of 10" is standard. Also available with horizontal feed.

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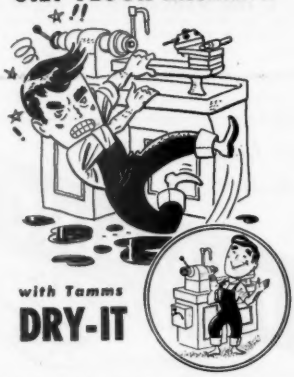

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